Shoulder Injuries
Diagnosis and Management

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Learning Objectives

Identify steps in the general examination of the anterior shoulder.

Recognize the mechanisms of injury, clinical signs and symptoms, diagnostic tests, and treatment for common shoulder disorders.

Disorders Of The Shoulder

Shoulder Anatomy & Physical Examination

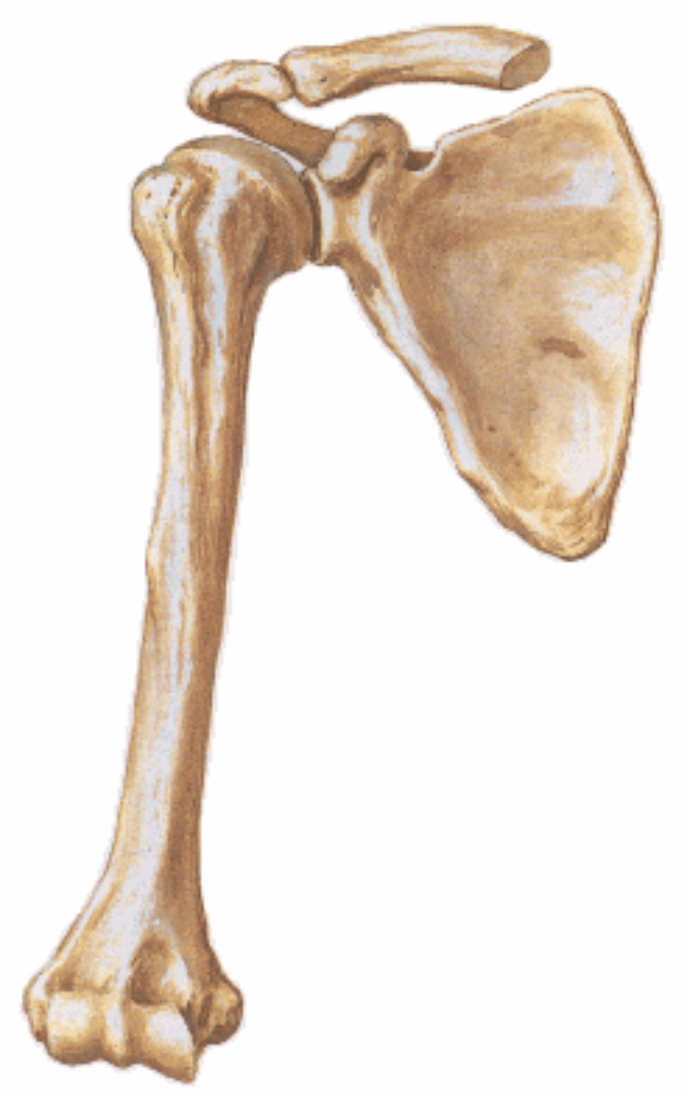
Fractures & Dislocations

Rotator Cuff Disorders

Separations

Anatomy Of The Shoulder Review

Bones



Scapula

Clavicle

Proximal Humerus

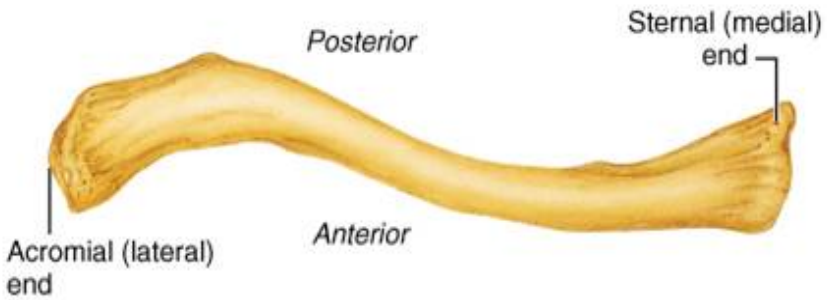
Bones

- **Scapula**
  - **Spans ribs 2 to 7**
  - **Three main processes**
    - **Spine**
    - **Acromion**
    - **Coracoid**

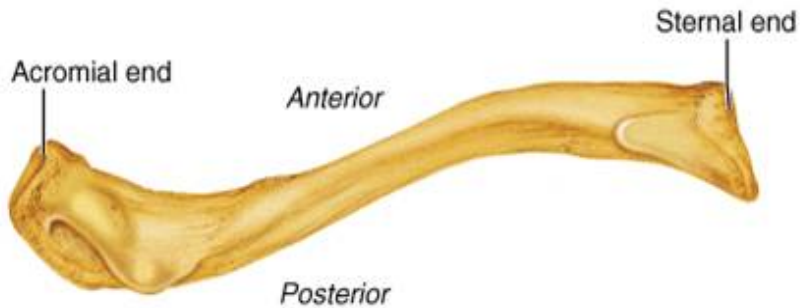
Bones

Clavicle

- Connects the sternum to the acromion
- "S" shaped



(b) Right clavicle, superior view



(c) Right clavicle, inferior view

Bones

Proximal humerus (parts)

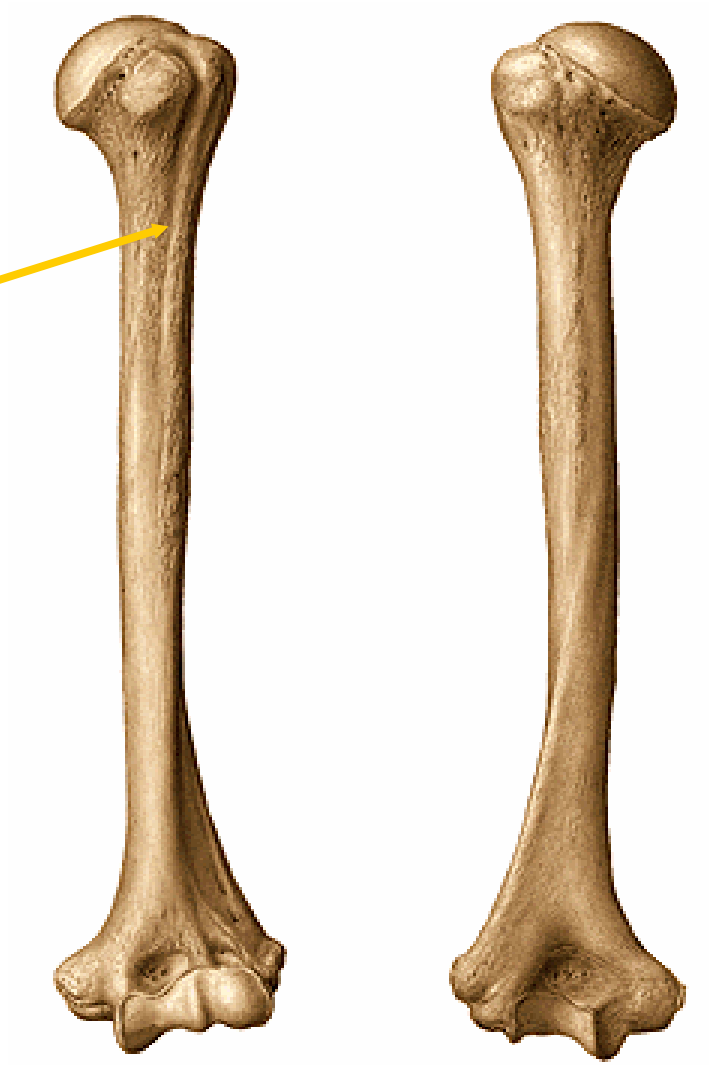
- **Head**
- **Anatomic neck**
- **Surgical neck (distal to the anatomic neck)**

Bones

- **Proximal humerus (parts)**
  - **Greater tuberosity (rotator cuff insertion - supraspinatus, infraspinatus, teres minor)**
  - **Lesser tuberosity (rotator cuff insertion - subscapularis)**

Bones

- **Proximal humerus (parts)**
  - **Intertubercular groove (bicipital groove) – Long head of the biceps**



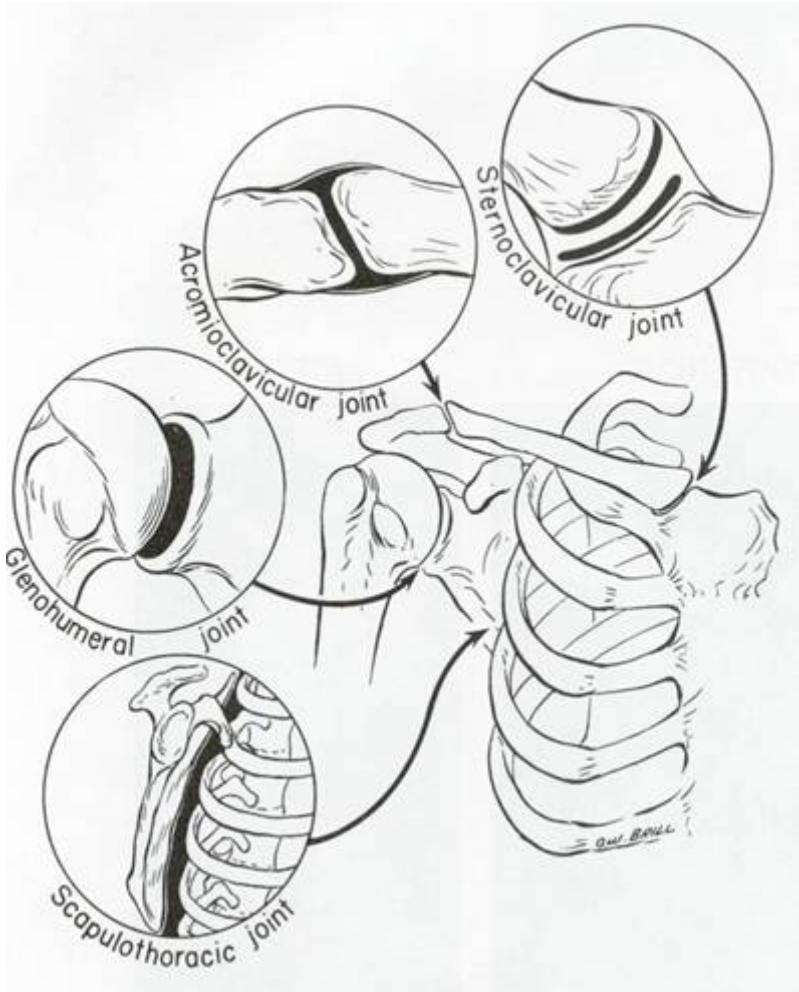
Joints

Glenohumeral joint

Sternoclavicular joint

Acromioclavicular joint

Scapulothoracic joint



Glenohumeral Joint

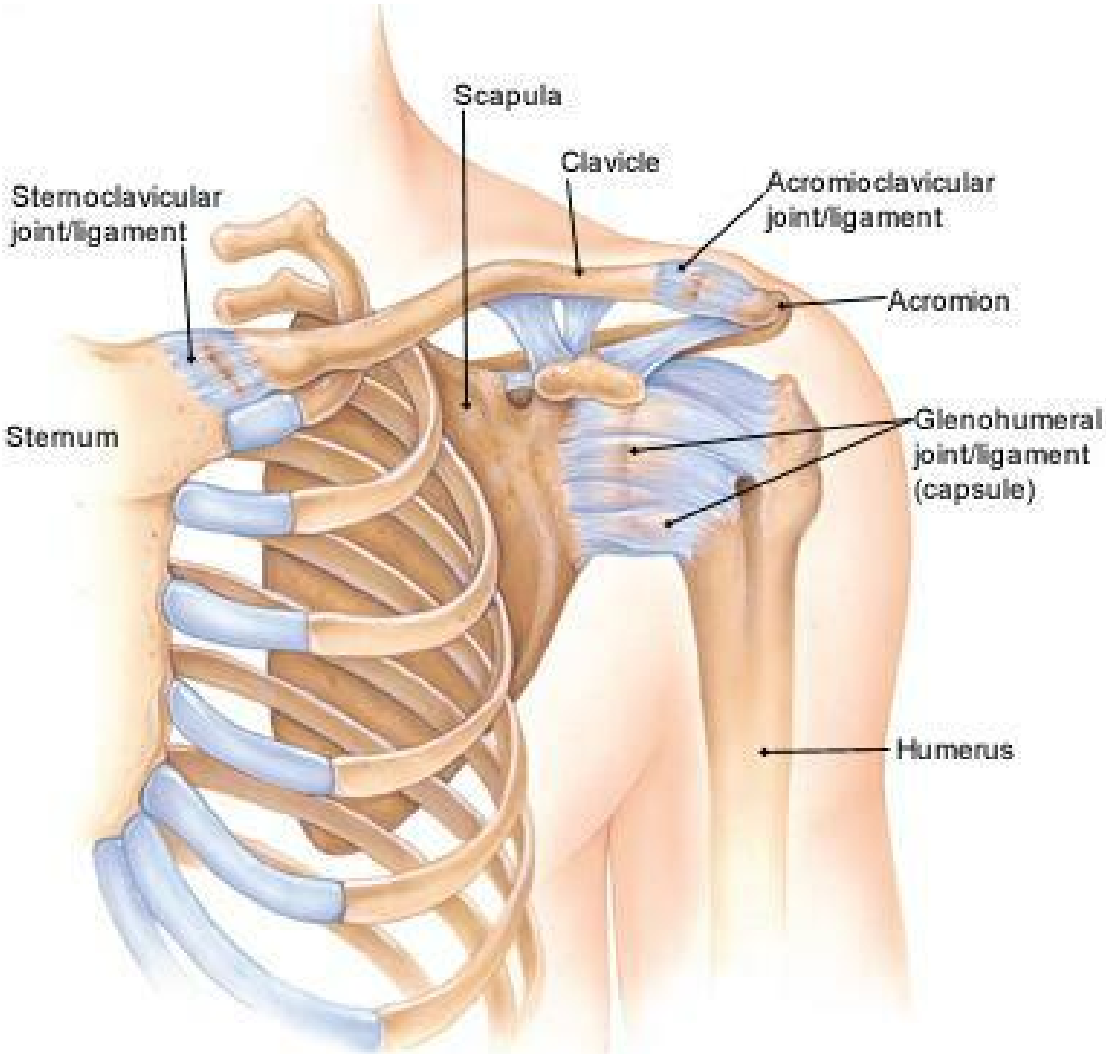
Ball (Humeral head) and socket (Glenoid)

Muscles provide the primary support

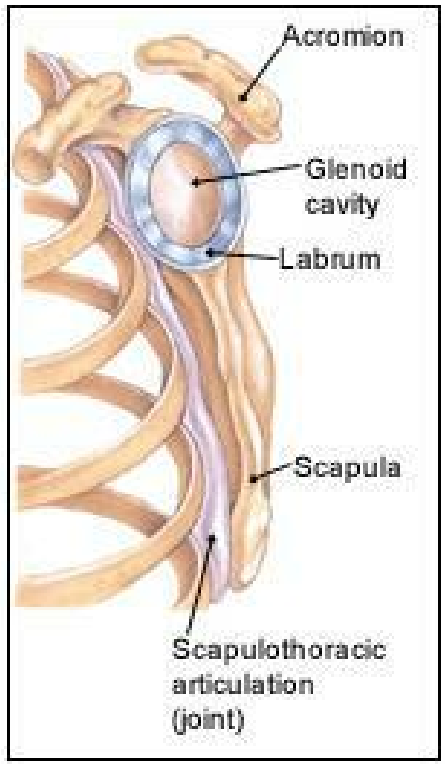
The labrum lines the glenoid cavity and deepens the socket

Ligaments - glenohumeral (inferior glenohumeral is the most important), coracohumeral, capsular

G-H Joint



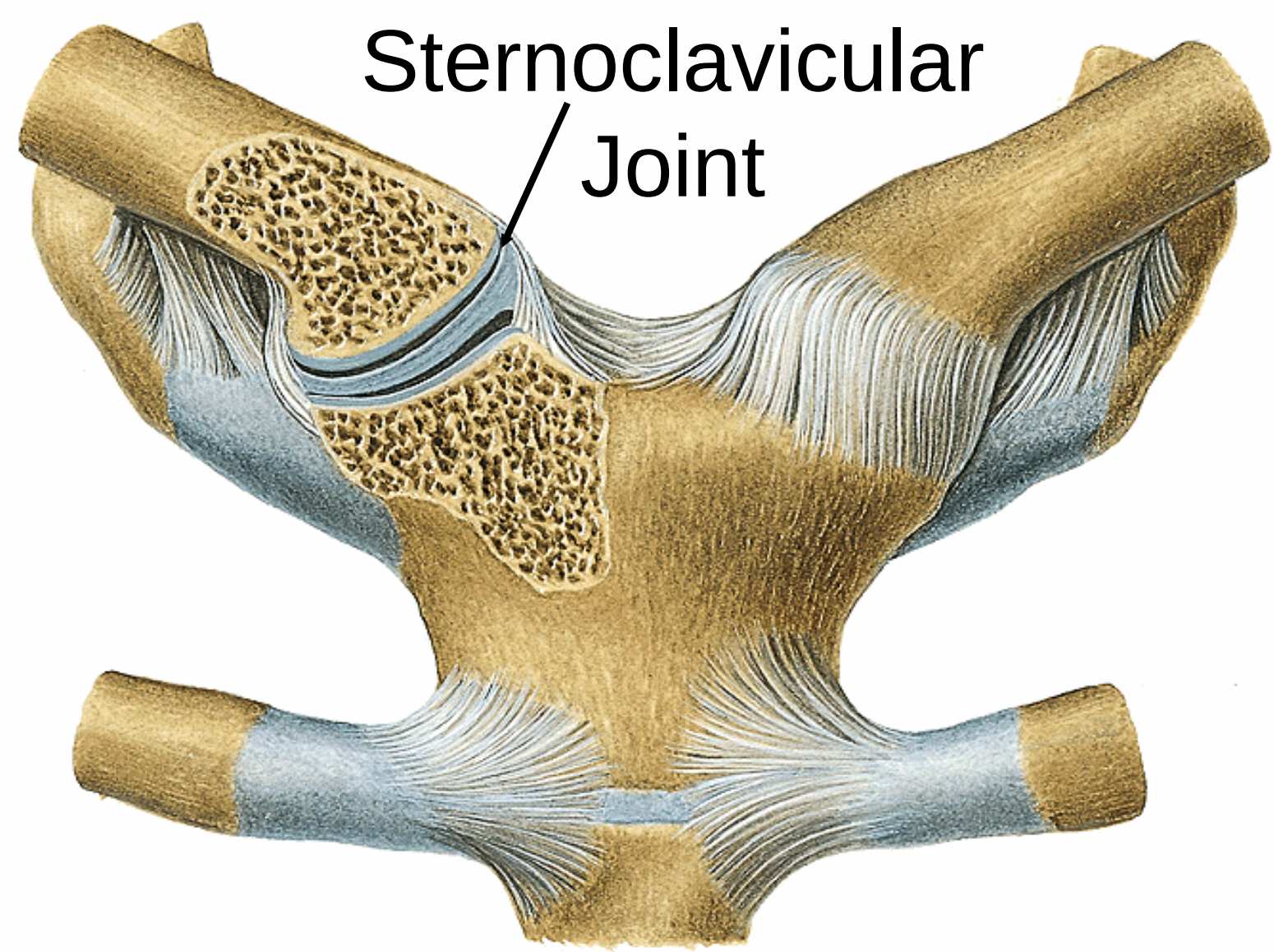
Anterior view



Anterolateral view

Sternoclavicular Joint

- Gliding joint
- The only bony attachment to the Axial skeleton is the S-C Joint
- Articular disc interspaced between surfaces
- Rotates 30 degrees with glenohumeral motion
- Ligaments - anterior and posterior sternoclavicular, capsular

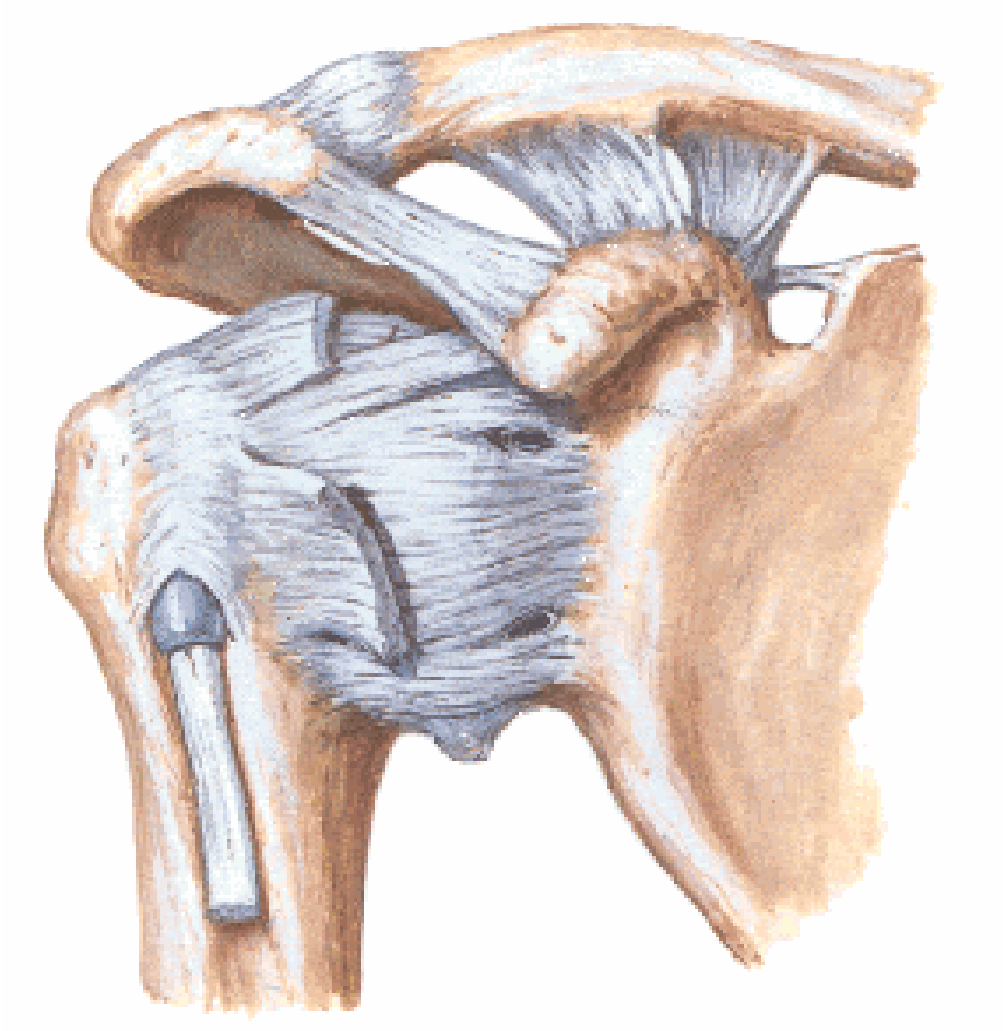

Sternoclavicular
Joint

Acromioclavicular Joint

Gliding joint

Disc interspaced between surfaces

Anchors the lateral clavicle

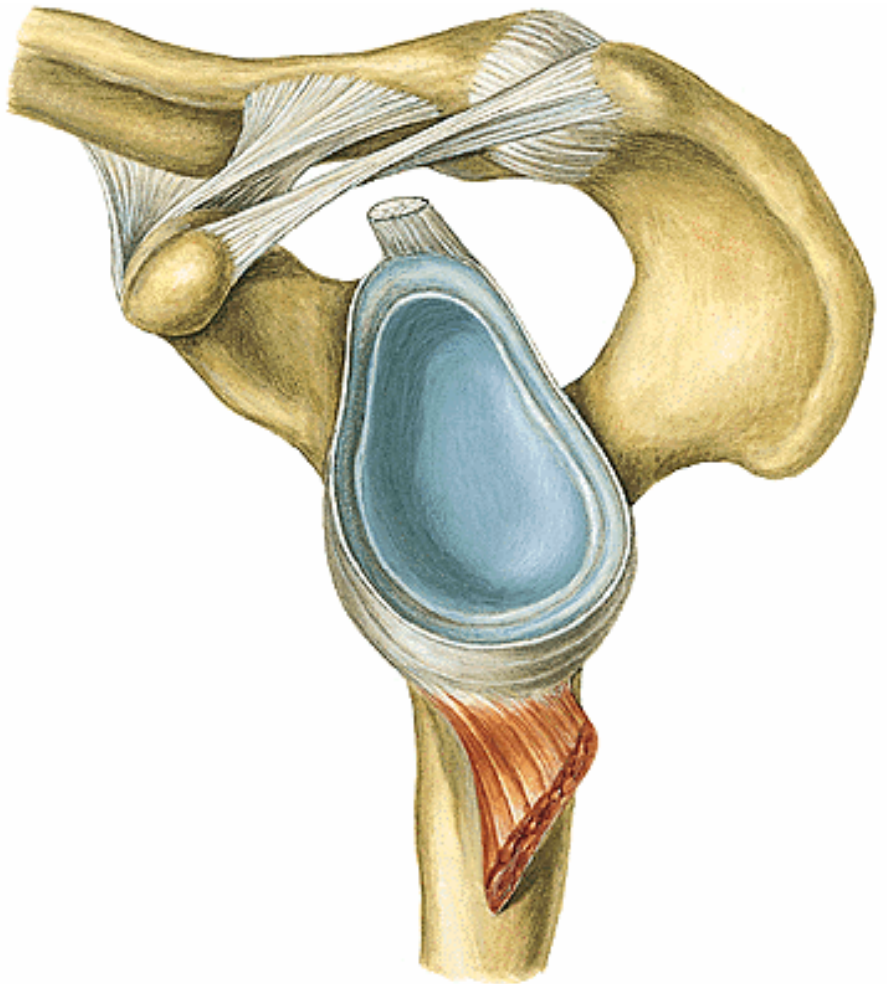


A-C Joint

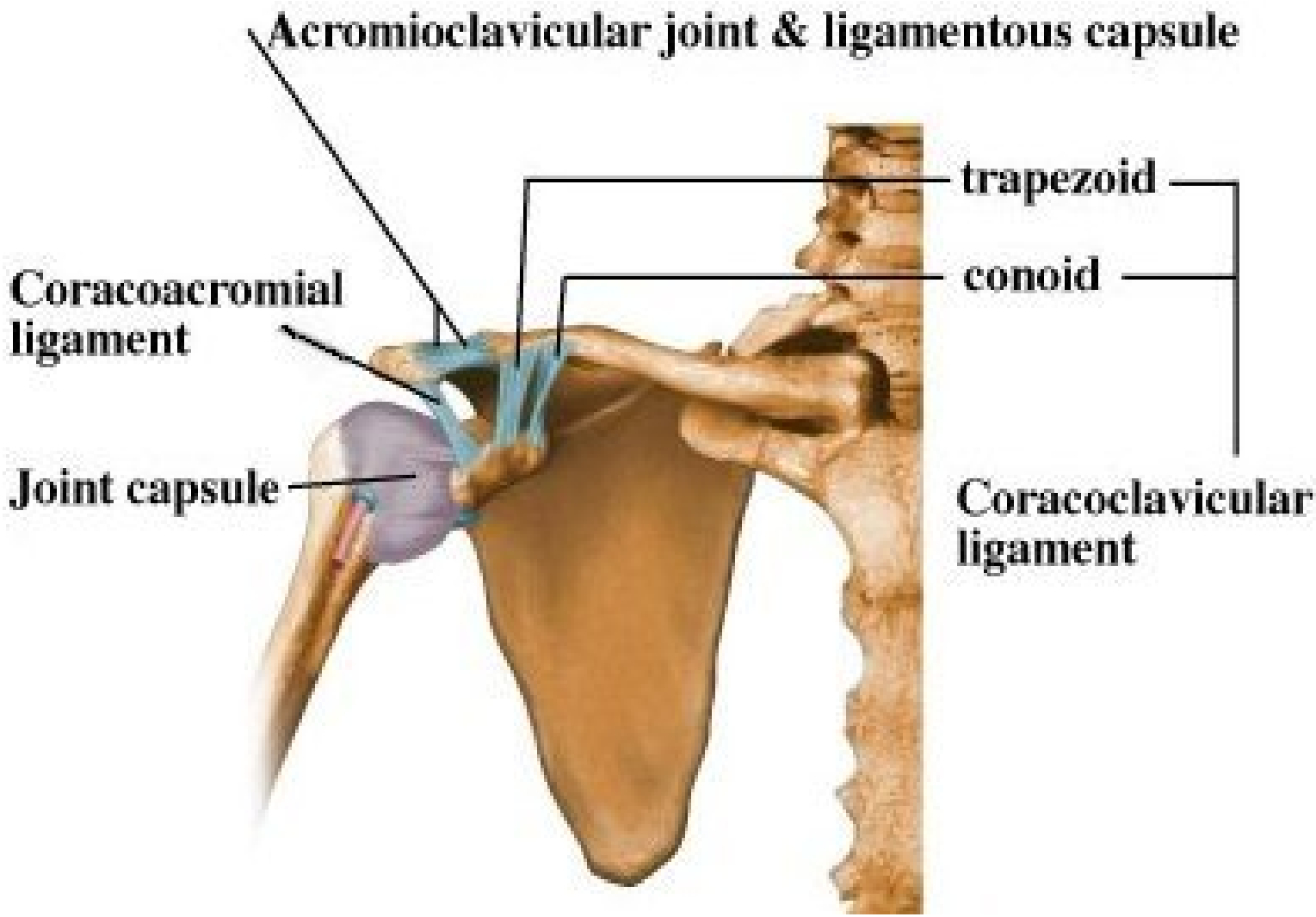
Ligaments

A-C

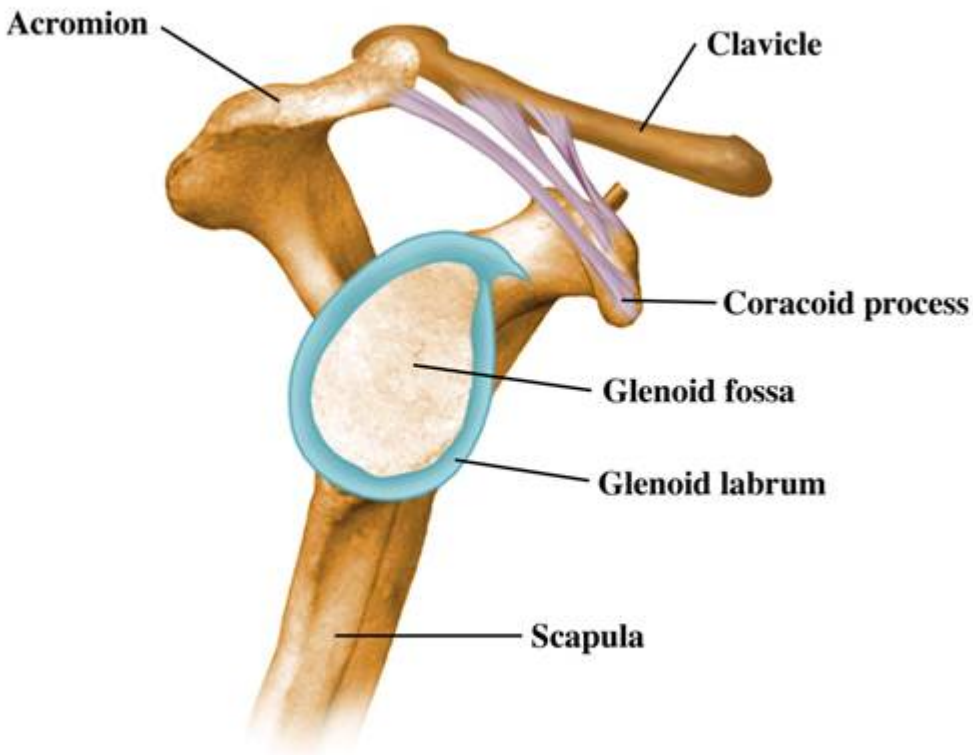
C-C



A-C Joint


Acromioclavicular joint & ligamentous capsule
trapezoid
conoid
Coracoacromial ligament
Joint capsule
Coracoclavicular ligament

A-C Joint

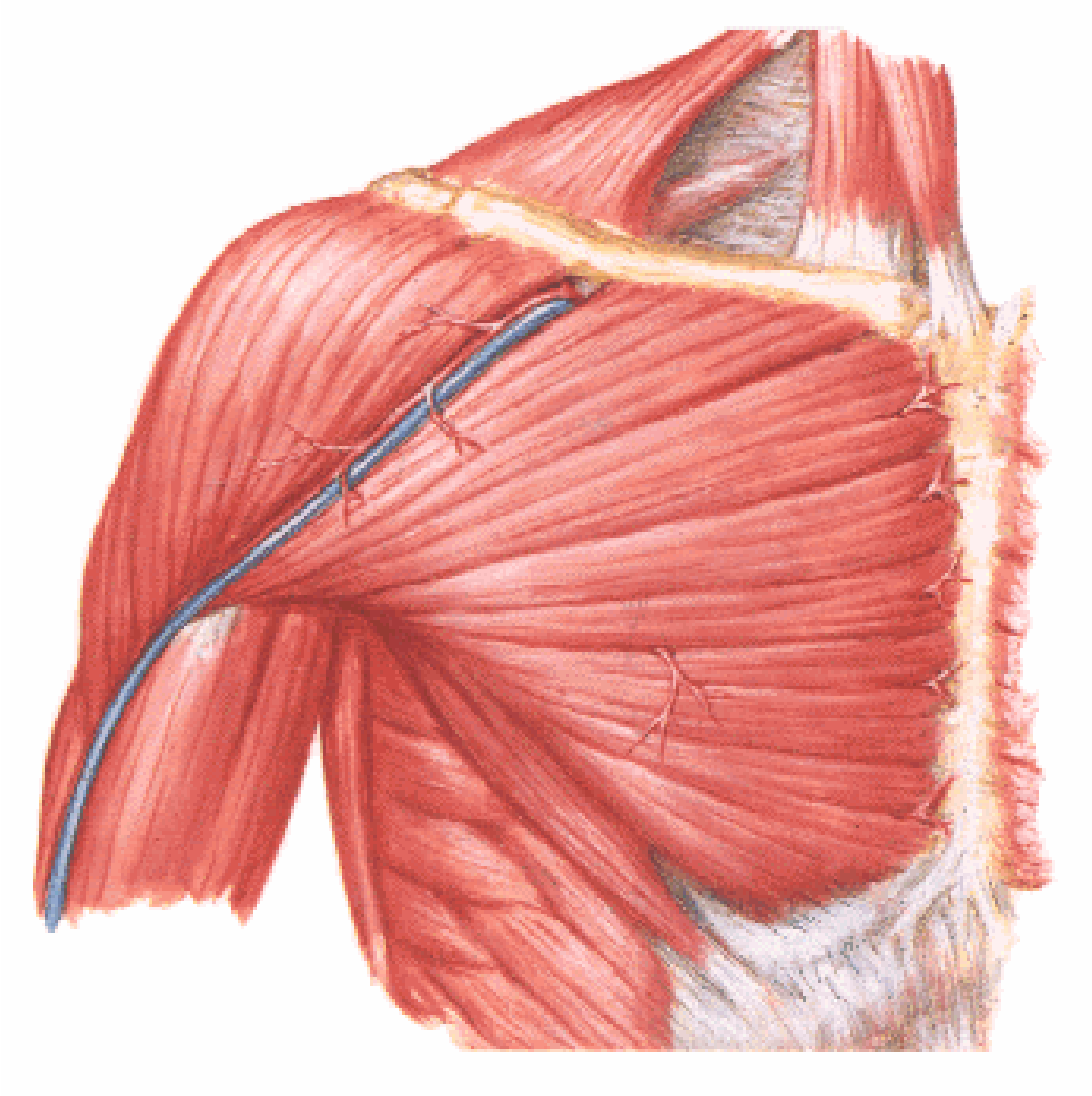

Acromion
Clavicle
Coracoid process
Glenoid fossa
Glenoid labrum
Scapula

Scapulothoracic Joint

Soft-tissue joint

Allows for scapular translation

Muscles



Muscles

Spine connectors

- **Trapezius (Upper, Middle & Lower)**
- **Latissimus dorsi**
- **Rhomboids (Major & Minor)**
- **Levator scapulae**
- **Scalenes**

Thoracic connectors

- **Pectoralis major**
- **Pectoralis minor**
- **Subclavius**
- **Serratus anterior**

Muscles

- **Shoulder movers**
  - **Deltoids (abduction, flexion, extension, horizontal AB/ADduction)**
  - **Teres major (adduction, internal rotation)**
  - **Supraspinatus (abduction, external rotation)**
  - **Infraspinatus (external rotation)**

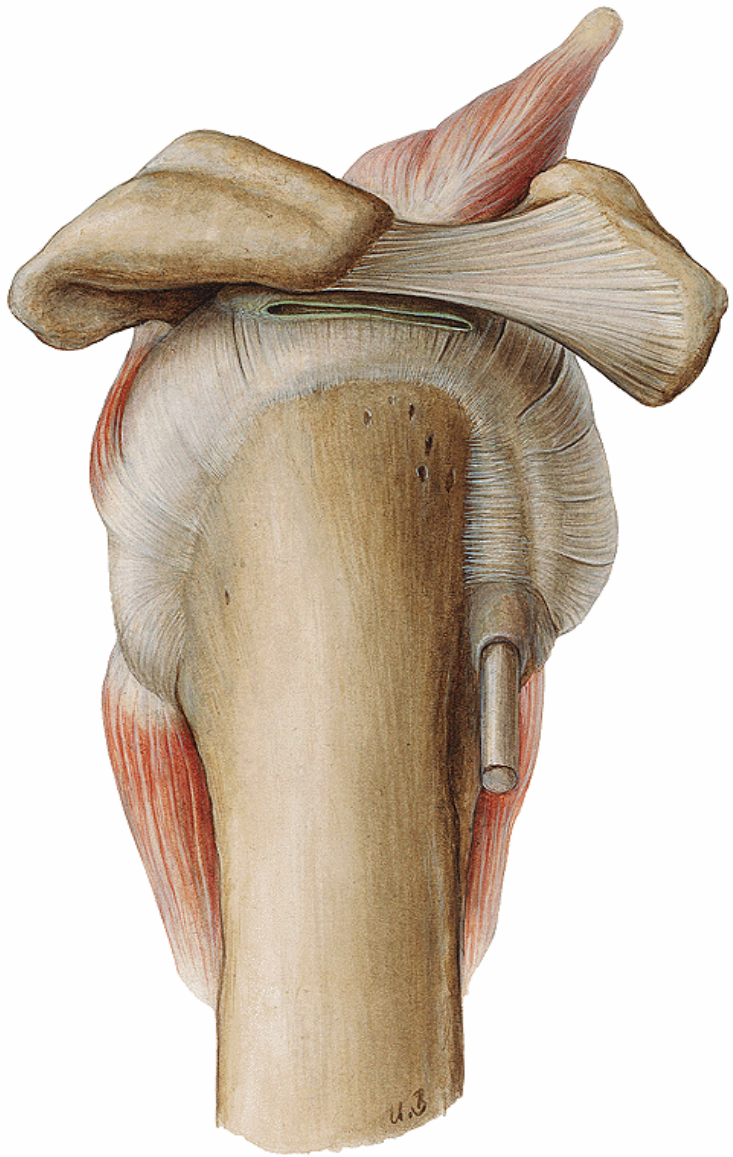
Muscles

Shoulder movers

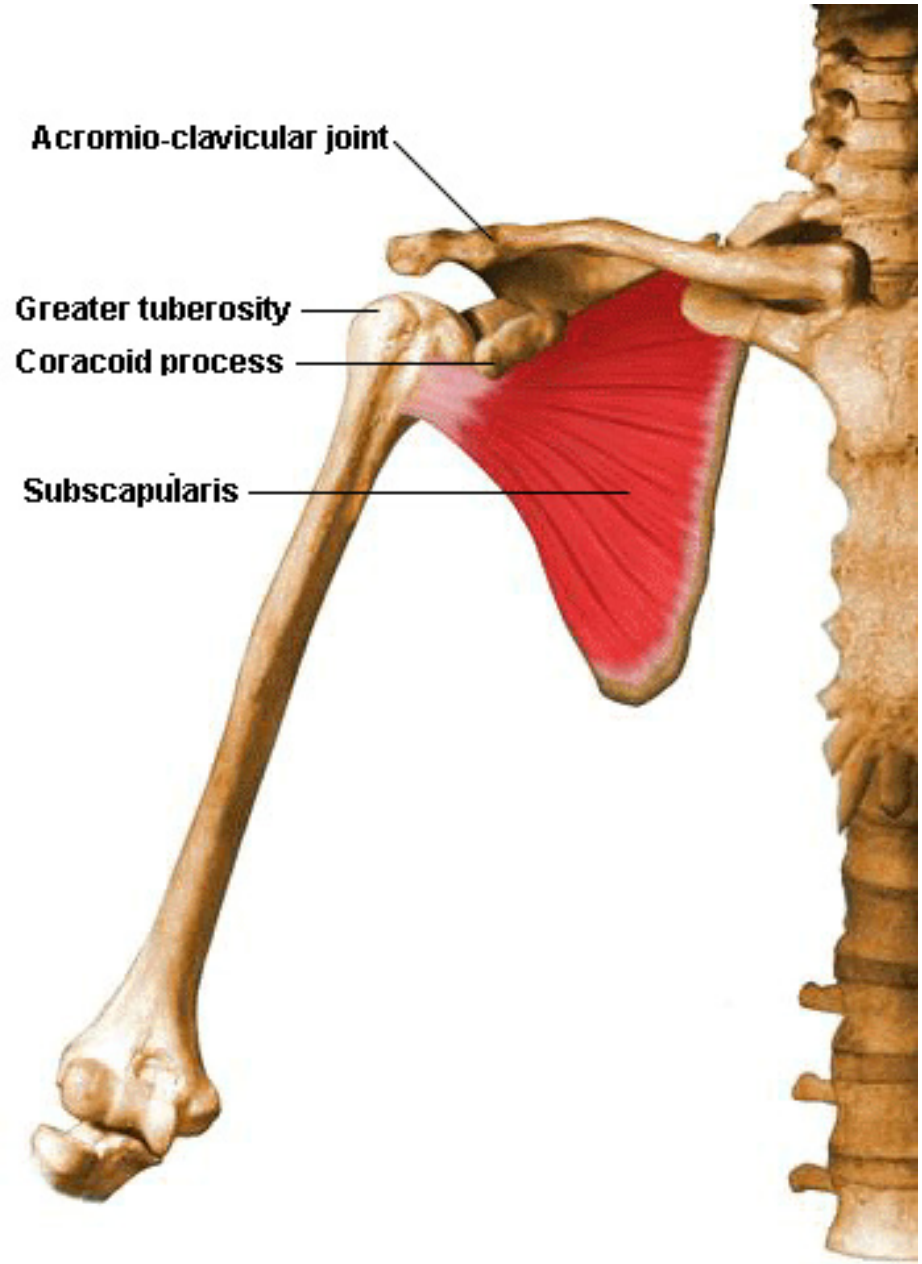
- **Teres minor (external rotation)**
- **Subscapularis (internal rotation)**
- **Coracobrachialis (flexion)**
- **Biceps long head (flexion)**

Muscles

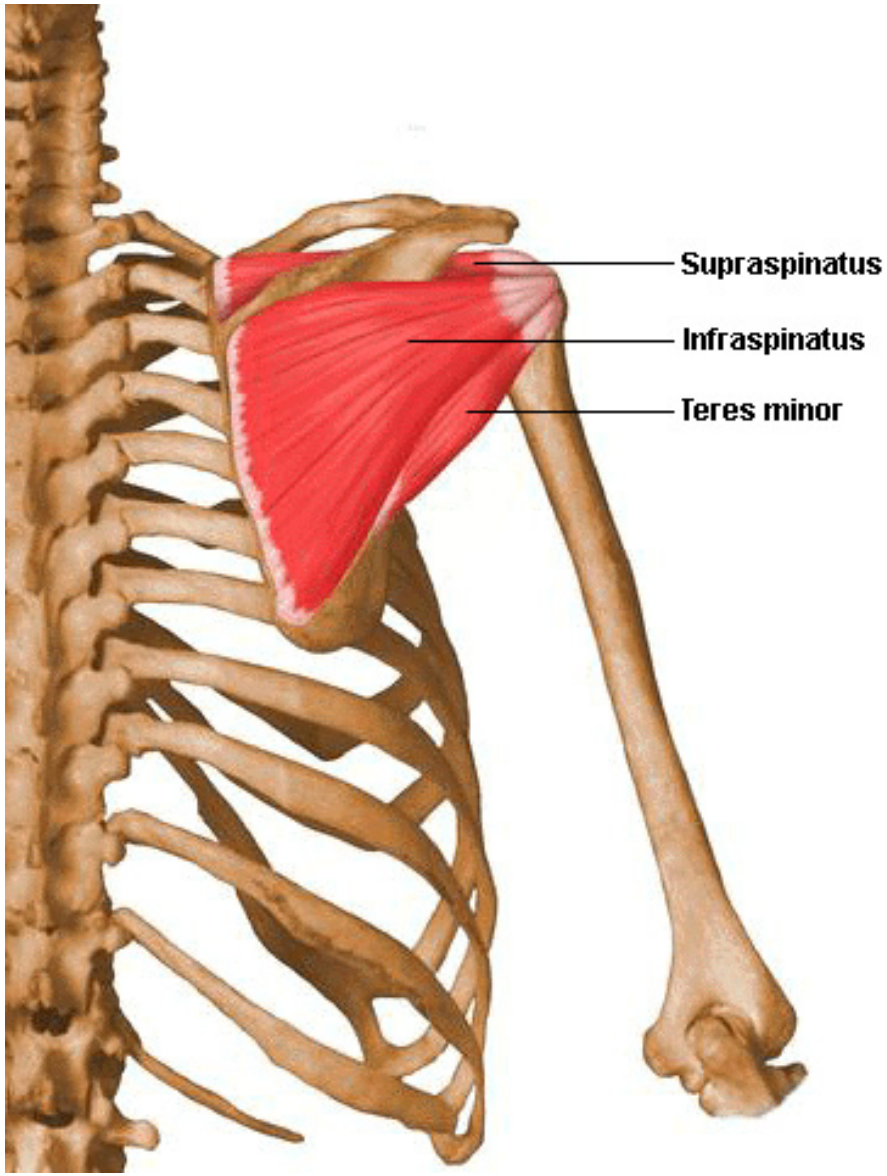
- **Rotator cuff muscles ("SITS")**
  - **Supraspinatus**
  - **Infraspinatus**
  - **Teres minor**
  - **Subscapularis**
- **Movers and dynamic stabilizers**



Rotator Cuff

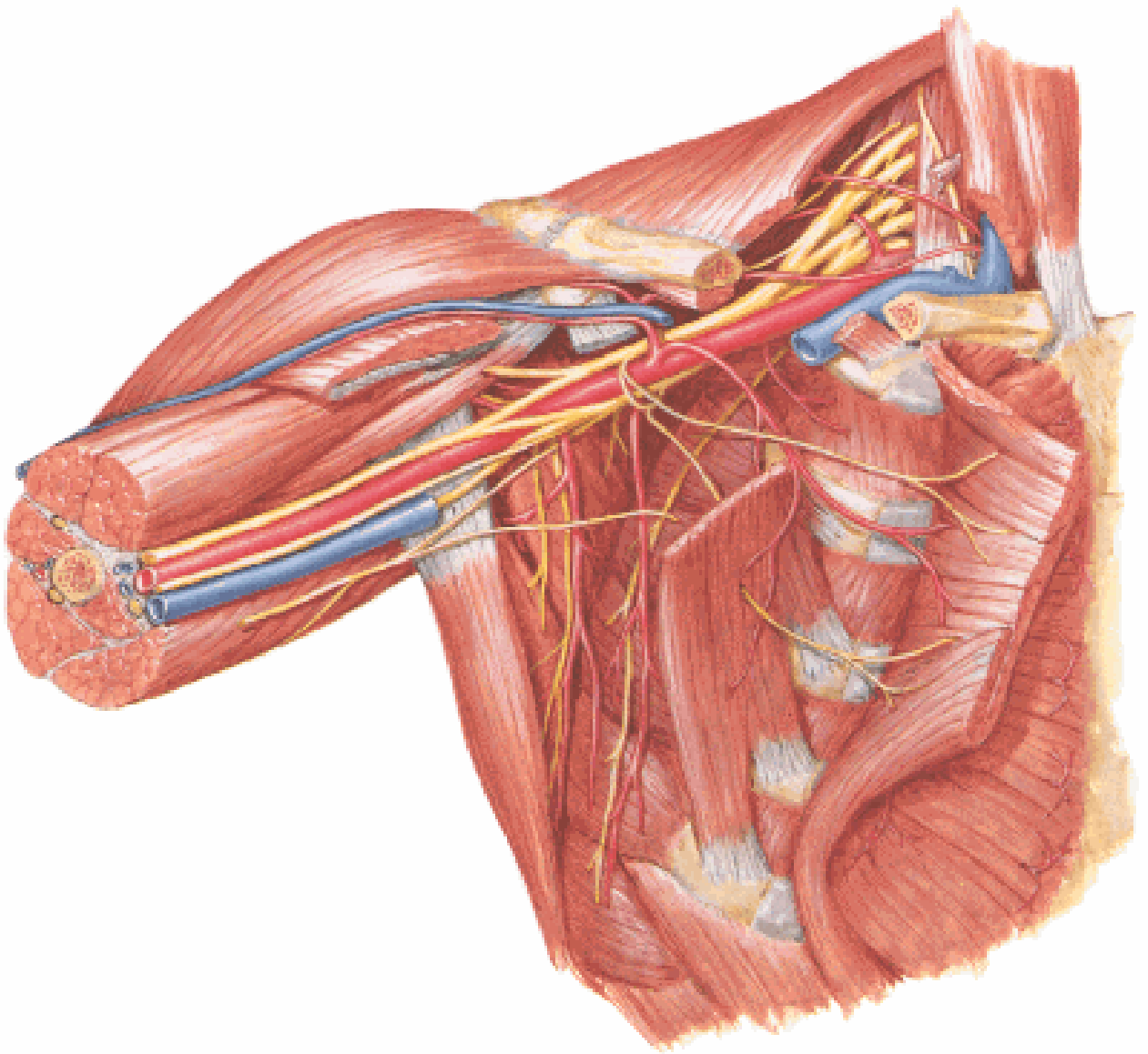


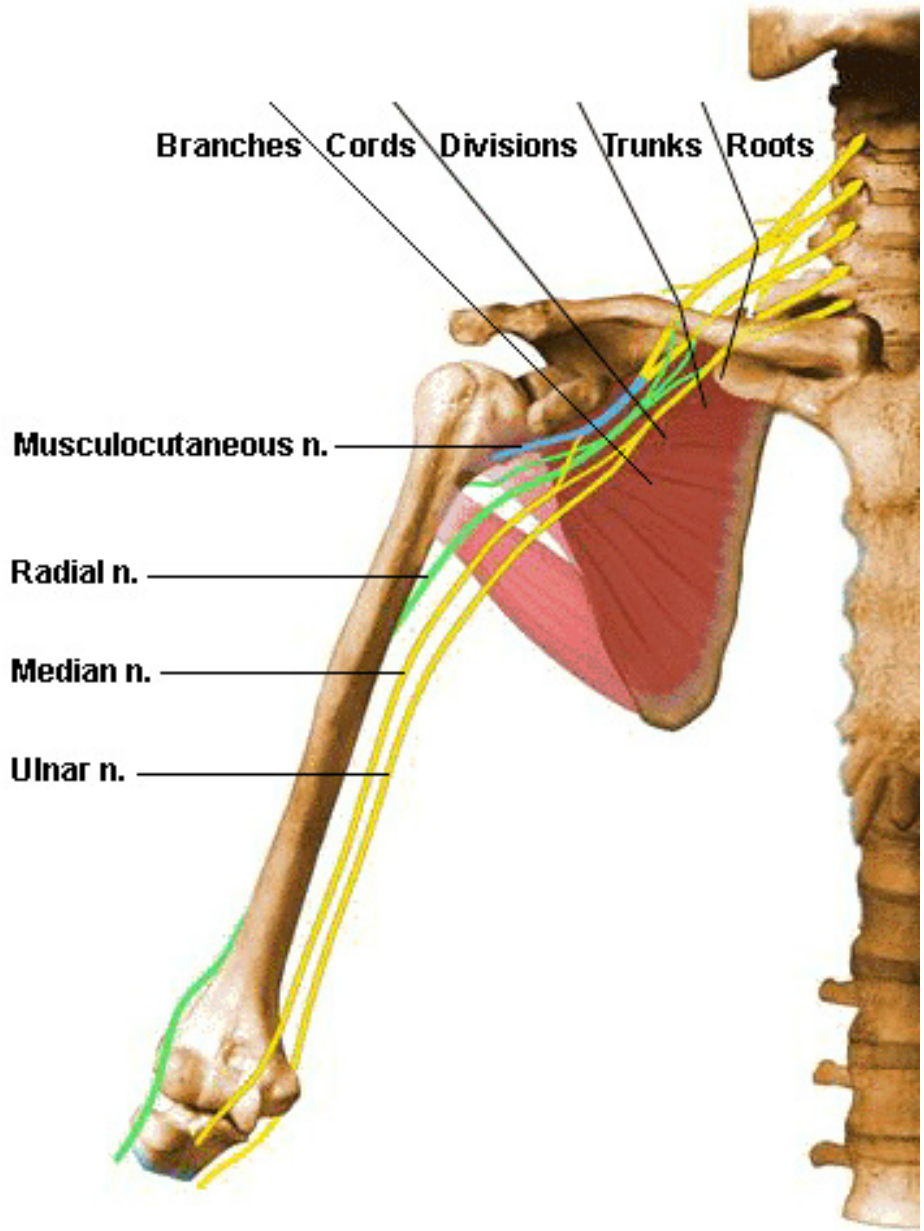
Rotator Cuff



Nerves

Brachial plexus

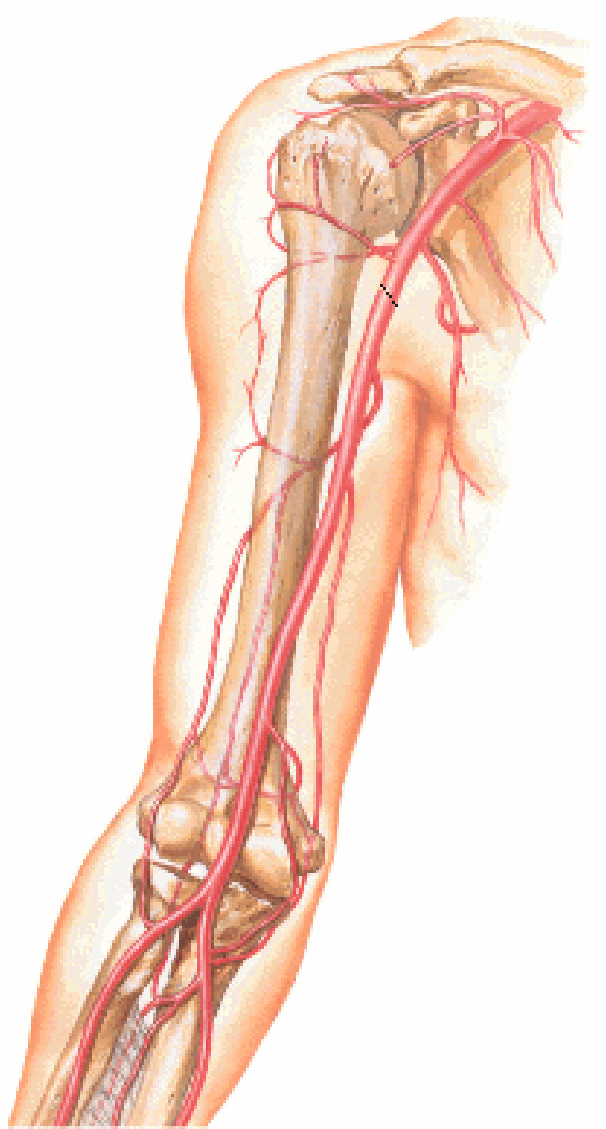




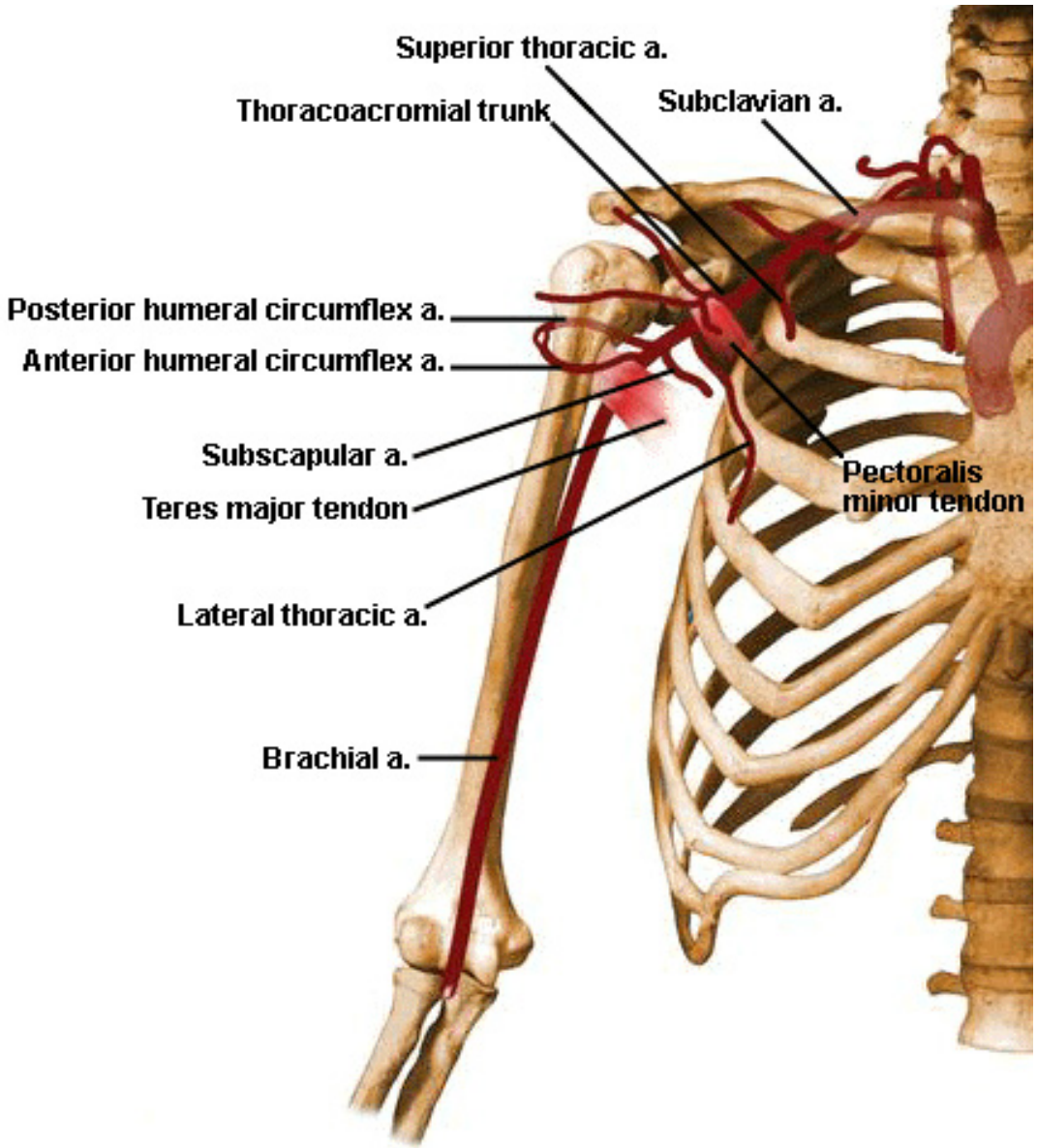
Brachial Plexus

Vessels

- **Subclavian artery**
- **Axillary artery (divided in thirds by the pectoralis minor)**
- **Anterior Humeral circumflex artery: primary blood supply to the humeral head**



Vessels


Superior thoracic a.
Thoracoacromial trunk
Subclavian a.
Posterior humeral circumflex a.
Anterior humeral circumflex a.
Subscapular a.
Teres major tendon
Pectoralis minor tendon
Lateral thoracic a.
Brachial a.

Range-of-motion

Abduction	**170 to 180**
Flexion and Elevation	**160 to 180**
Scapular Elevation	**170 to 180**
Lateral (External) Rotation	**80 to 90**
Medial (Internal) Rotation	**60 to 100**

Range-of-motion

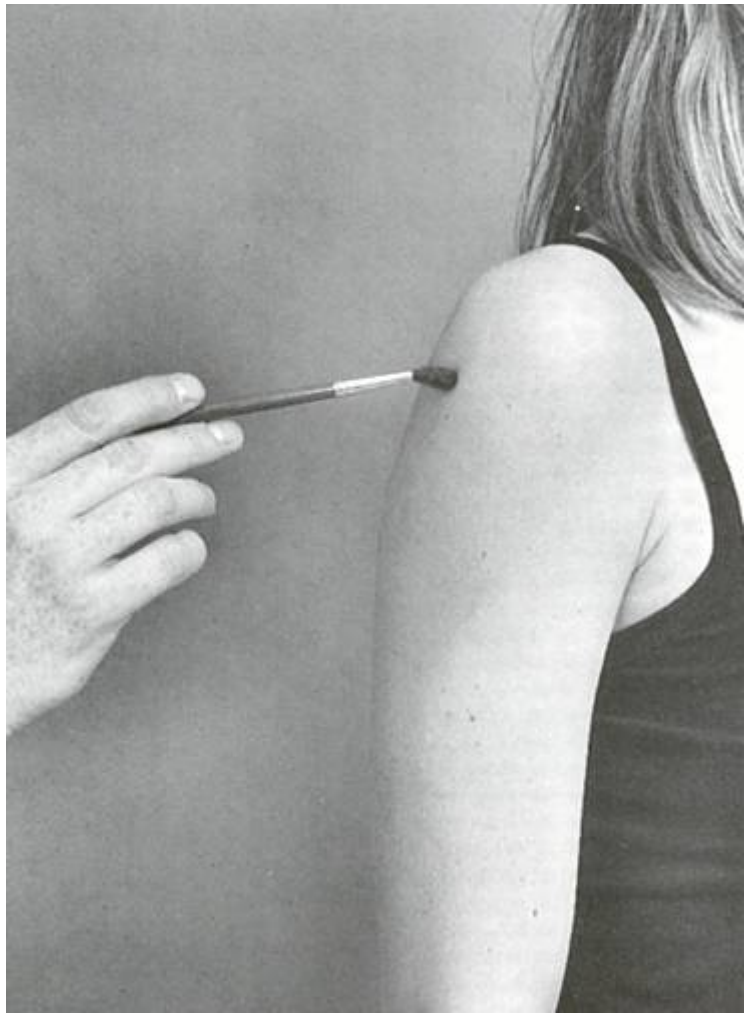
…Cont’

Extension	50 to 60
Adduction	50 to 75
Horizontal AB/ADduction	130
Circumduction	200

Neurovascular Examination

Sensation

Axillary nerve (C5) lateral arm

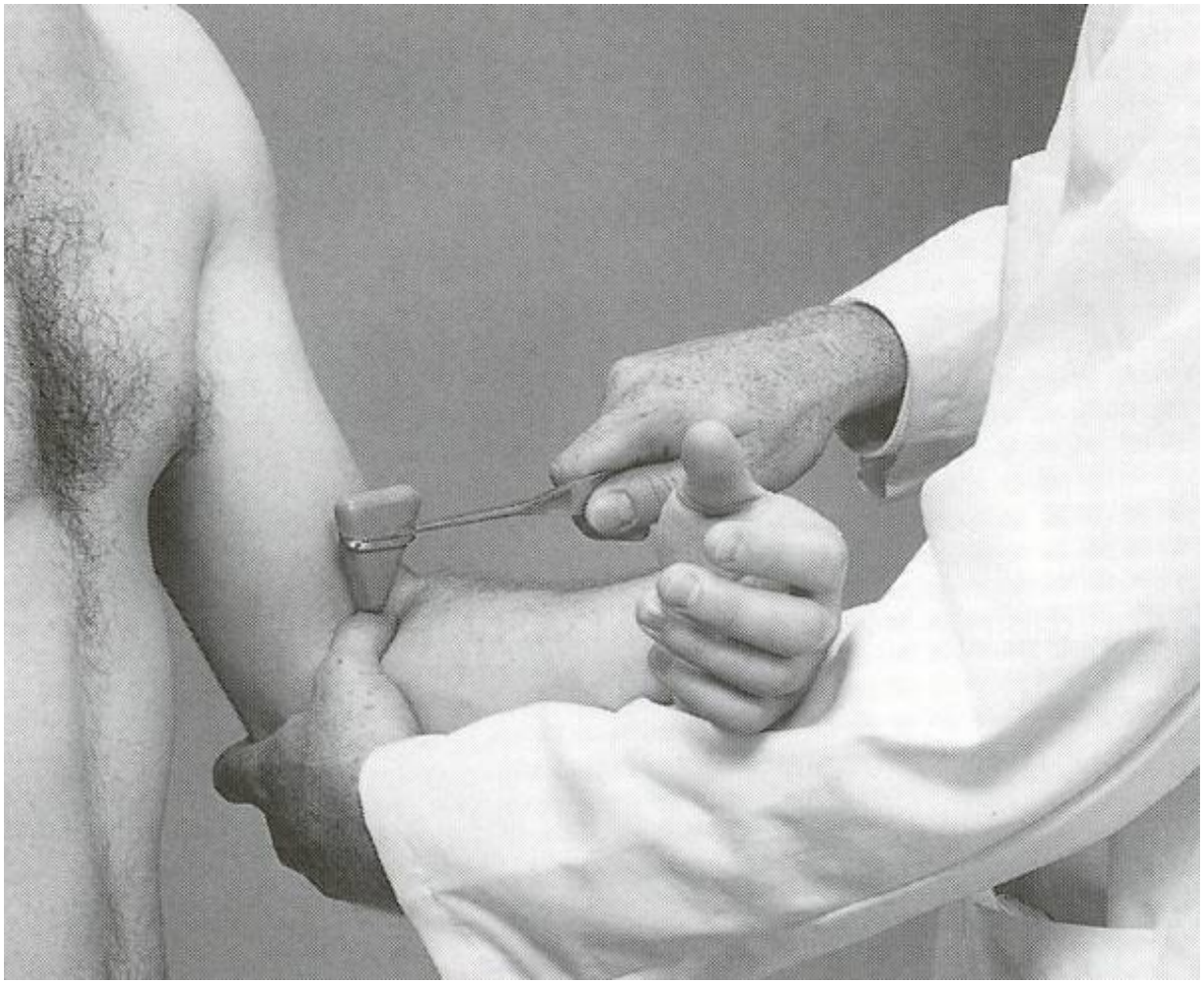


Reflexes

Reflexes

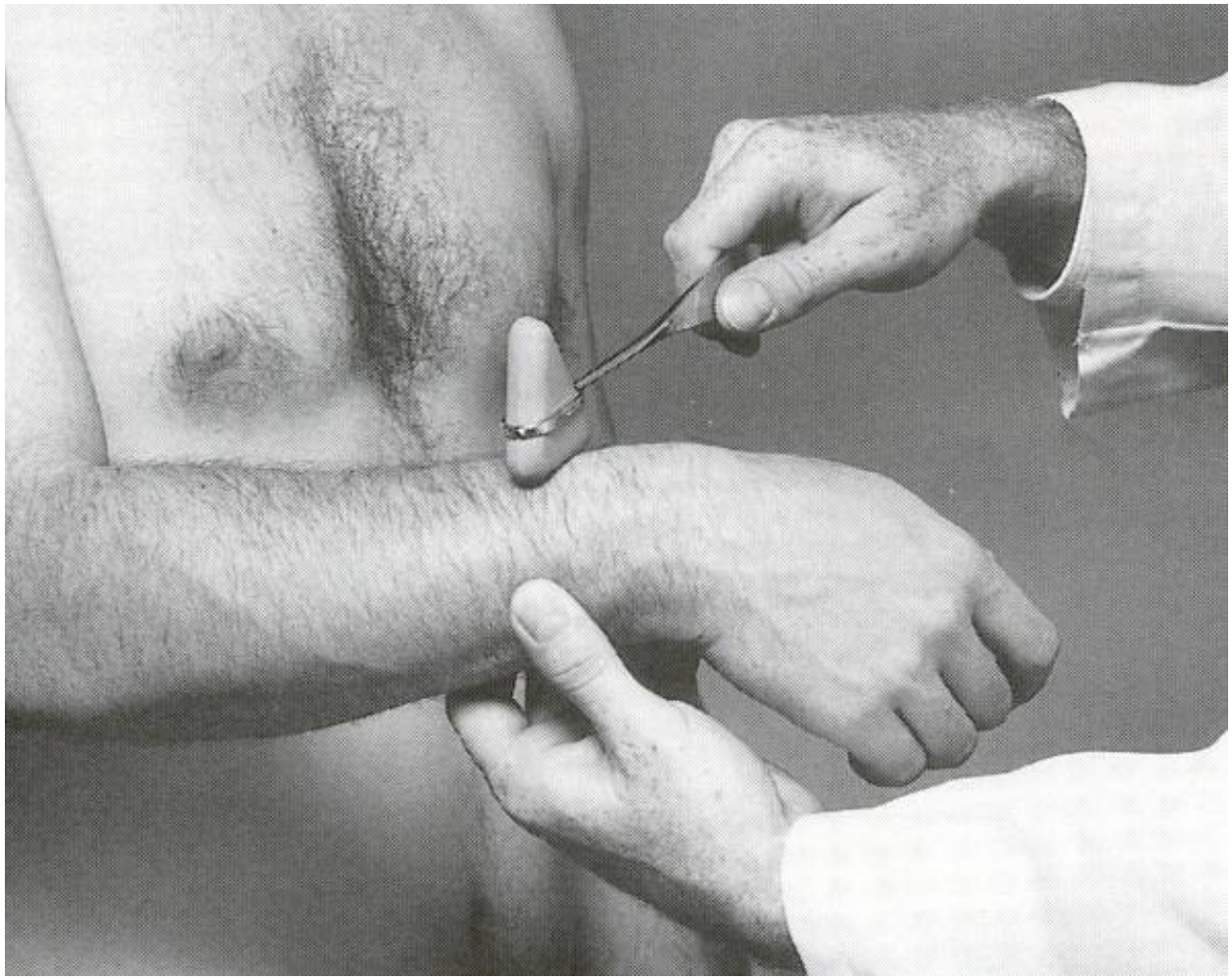
- Biceps (C5)
- Brachioradialis (C6)
- Triceps (C7)

Reflexes

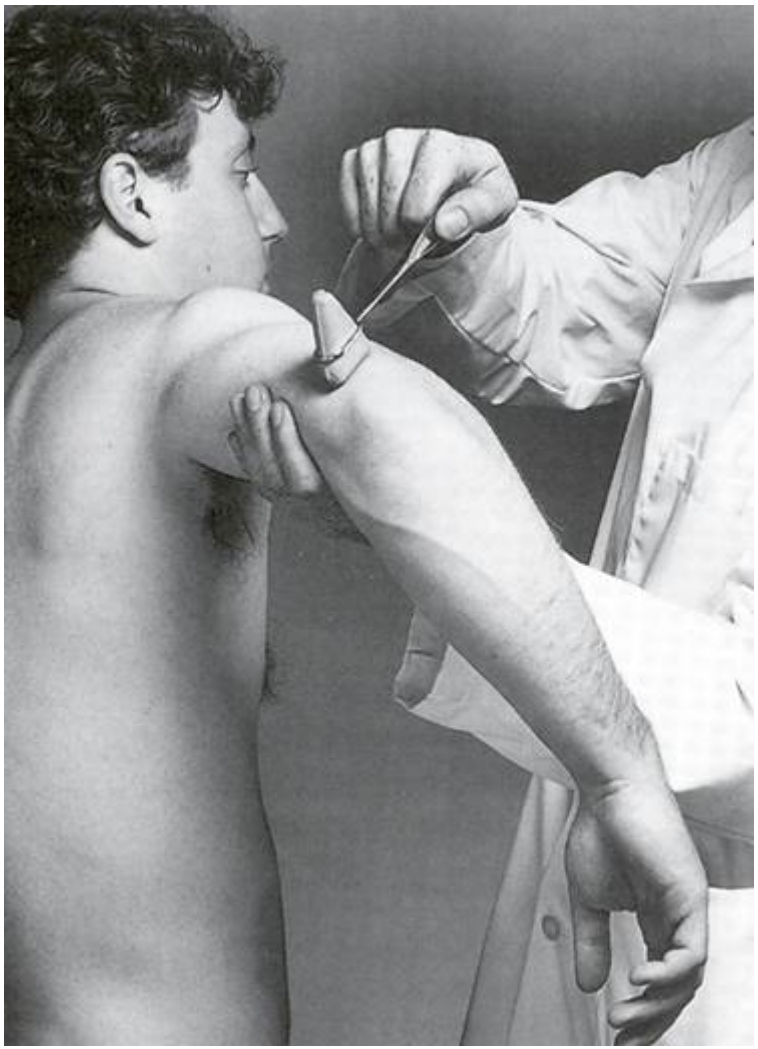


Biceps (C5)

Reflexes



Brachio-Radialis (C6)



Reflexes

Triceps
(C7)

Dislocations/Separations

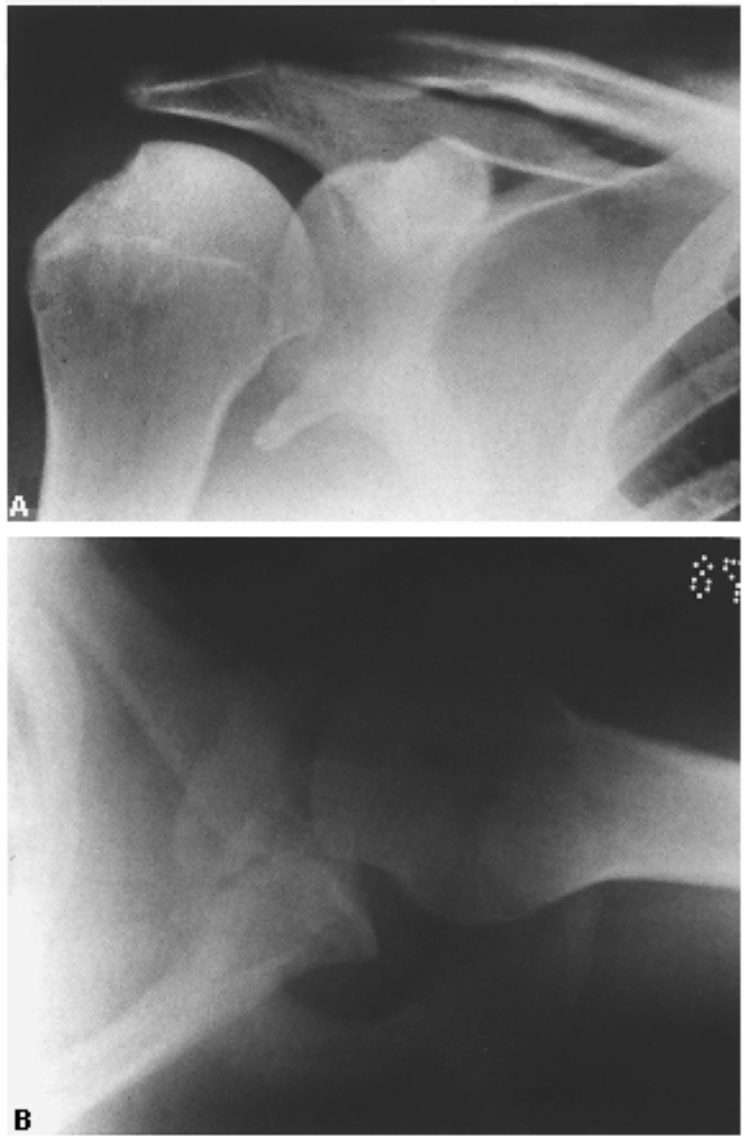
Definition: Complete or incomplete loss of congruity of a joint

Synonyms

- **Subluxation**
- **Multi-directional Instability**

Discussion

- **Shoulder**



Dislocations/Separations

Classification

TUBS -- Traumatic, Unidirectional, Bankhart lesion, Surgery

Dislocations/Separations

Classification

AMBRI -- Atraumatic, Multi-directional, Bilateral, Rehabilitation, Inferior Capsular Shift

Dislocations/Separations

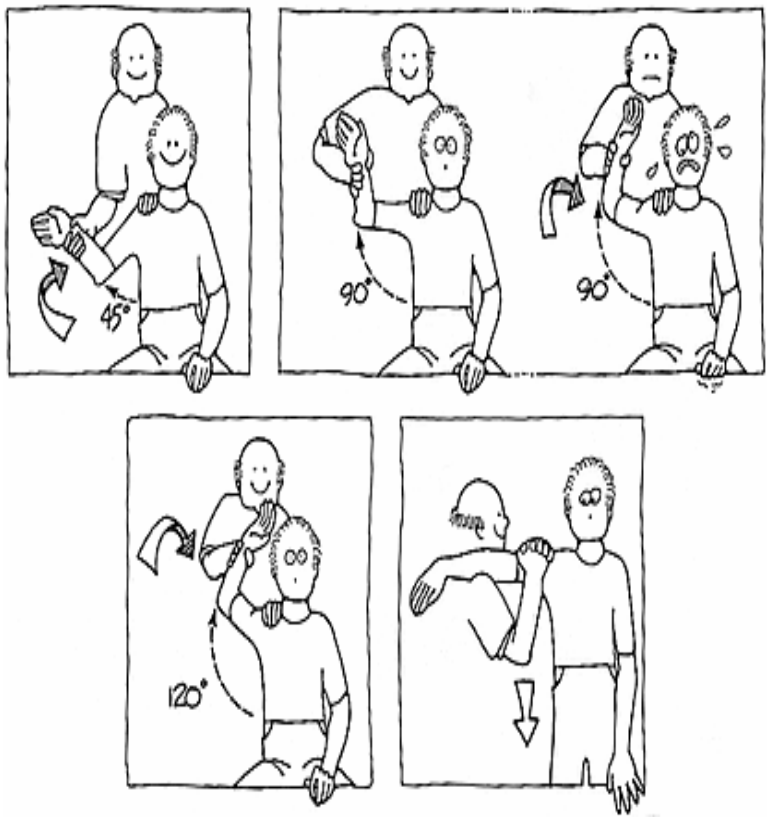
Physical Exam

- **+ Apprehension Test**
- **+ Reduction/Release Test**
- **+ Sulcus Sign**
- **+ Anterior/Posterior Translation/Drawer Test**
- **+ Jerk Test**

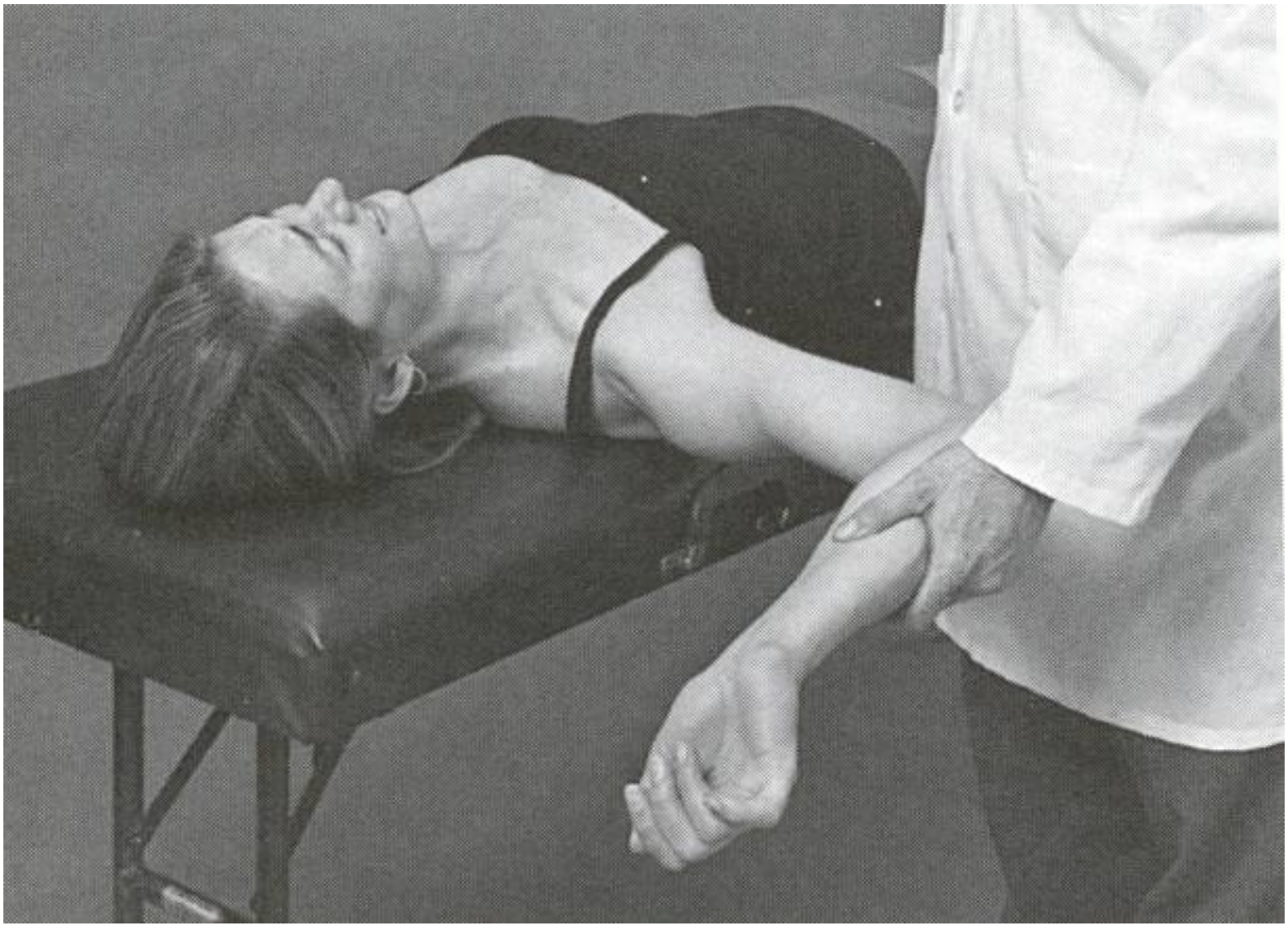
Dislocations/Separations

Physical Exam

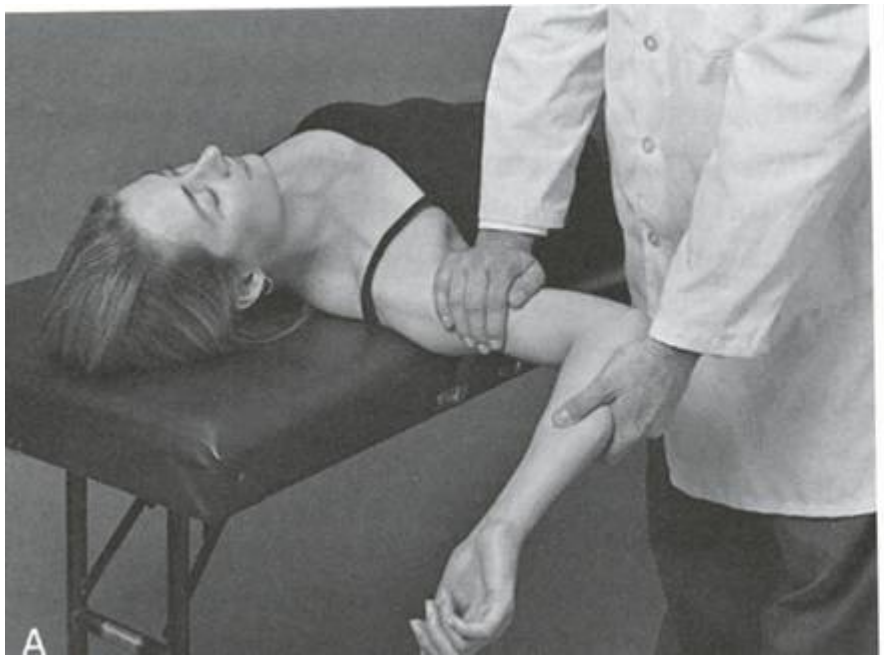
Apprehension Test

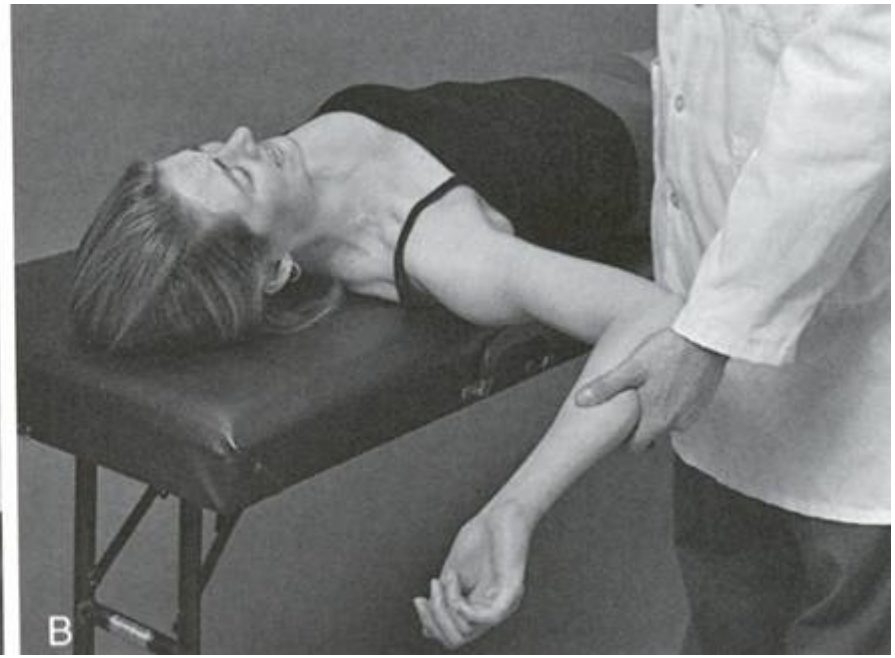


Apprehension Test



Relocation/Release

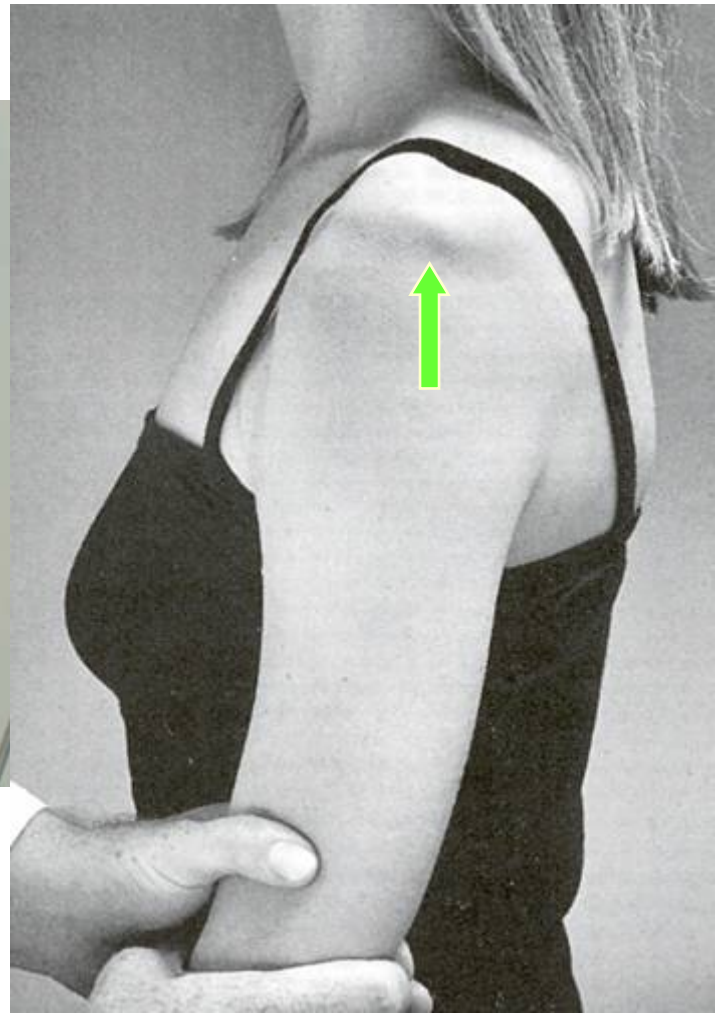




Relocation

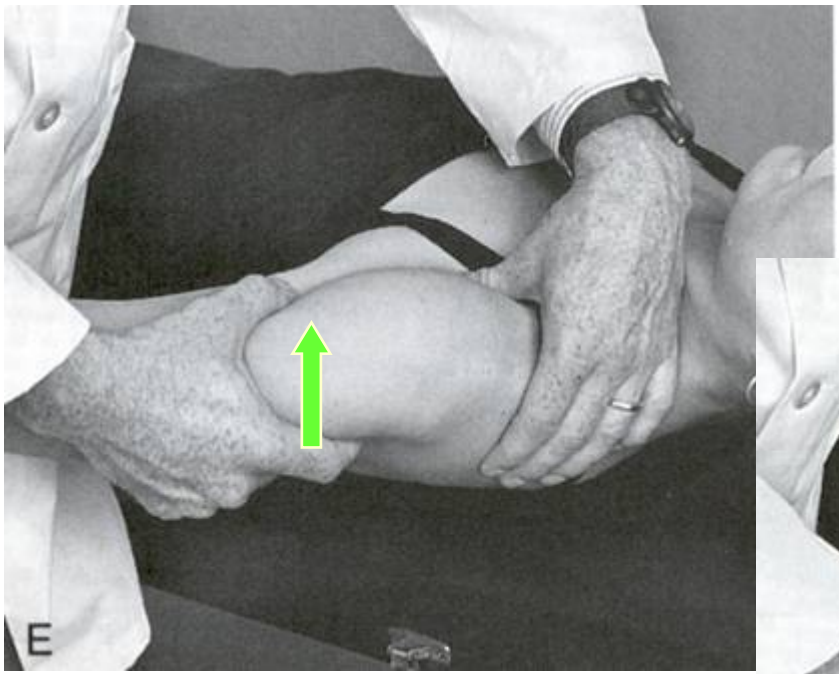
Release (Apprehension Test)

Dislocations/Separations



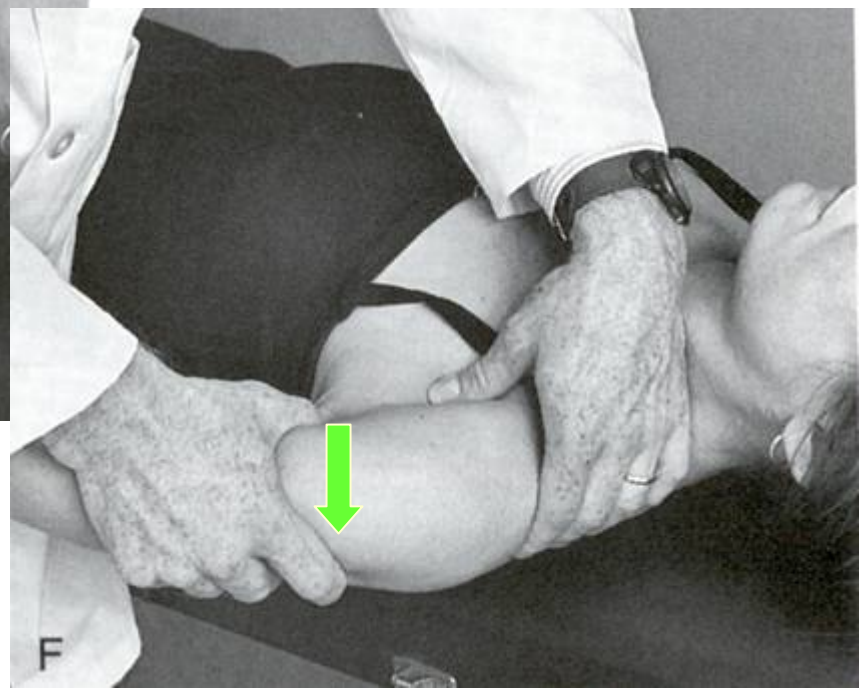
Sulcus Sign

Dislocations/Separations



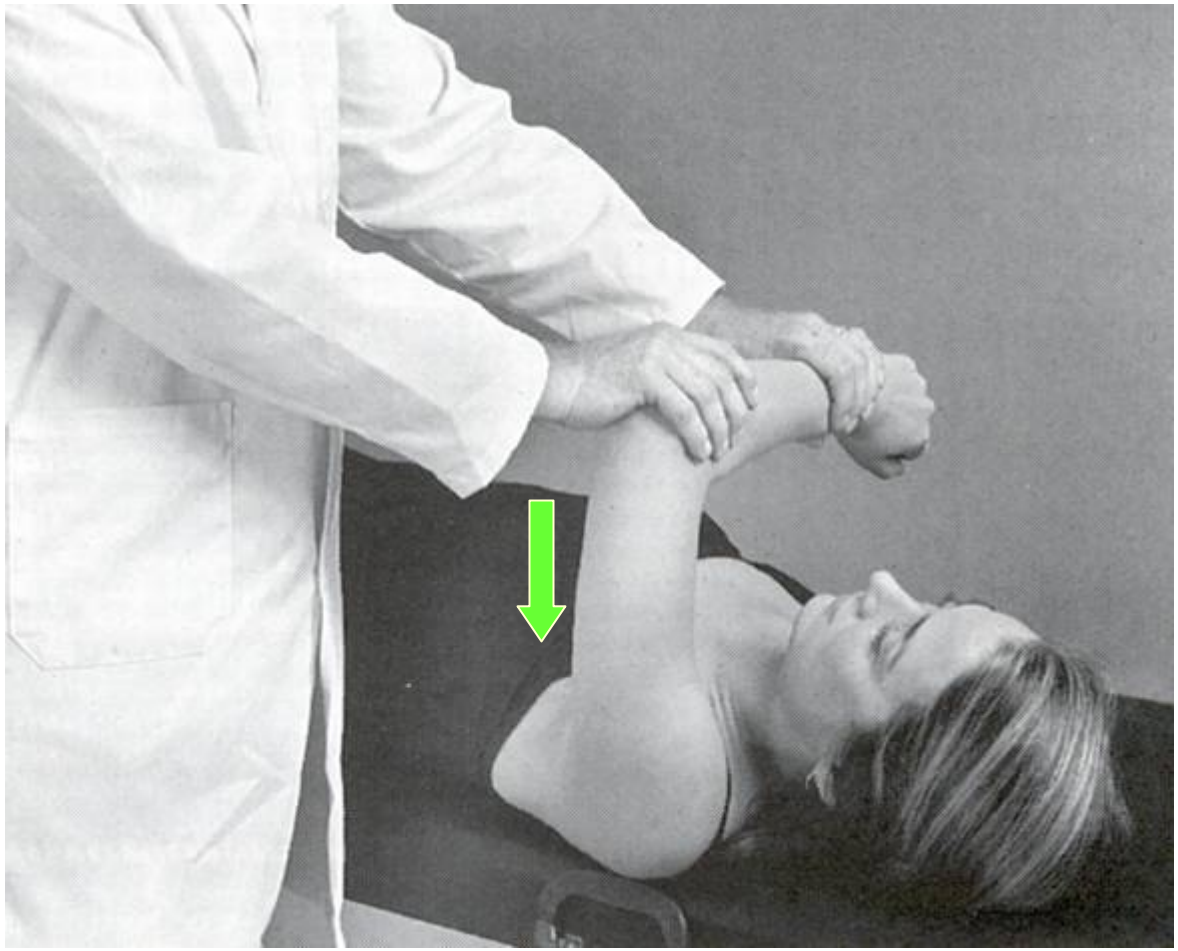
Anterior Translation

Posterior Translation



Dislocations/Separations

Jerk Test

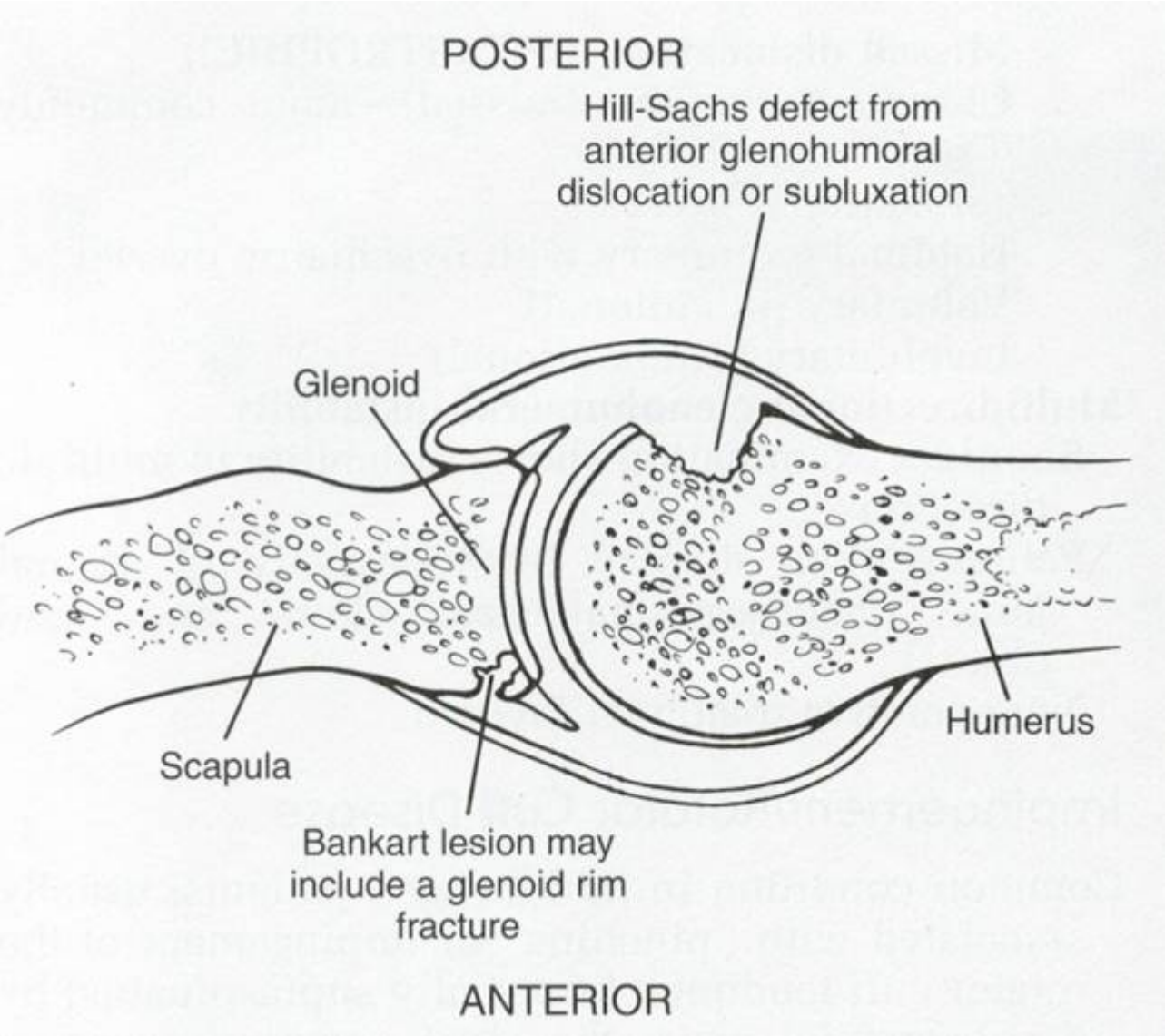


Associated Injuries

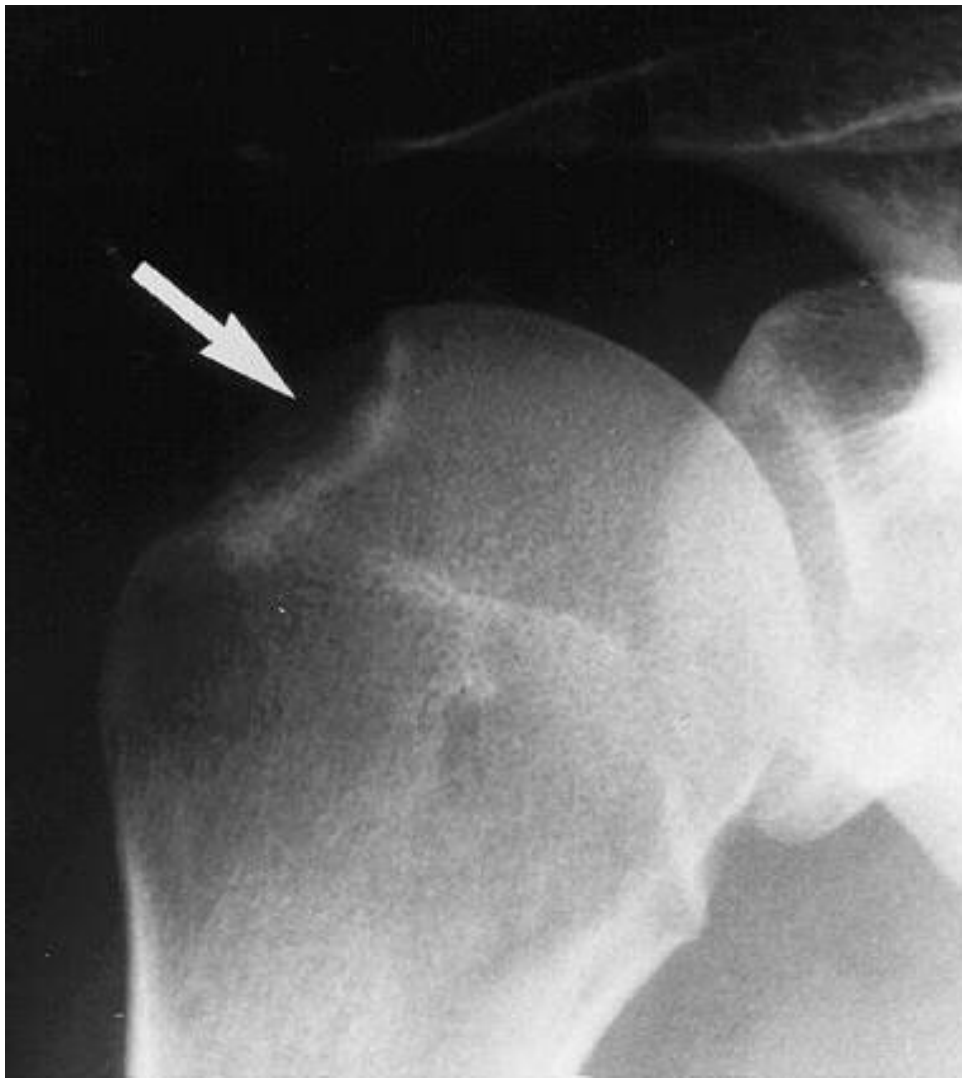
Hill- Sachs defect - impression fracture in the posterolateral humeral head

Bony Bankhart lesion - anterior inferior glenoid rim injury

Greater tuberosity fracture - especially in older patients


POSTERIOR
Hill-Sachs defect from anterior glenohumoral dislocation or subluxation
Glenoid
Scapula
Humerus
Bankart lesion may include a glenoid rim fracture
ANTERIOR

Hill – Sachs Lesion

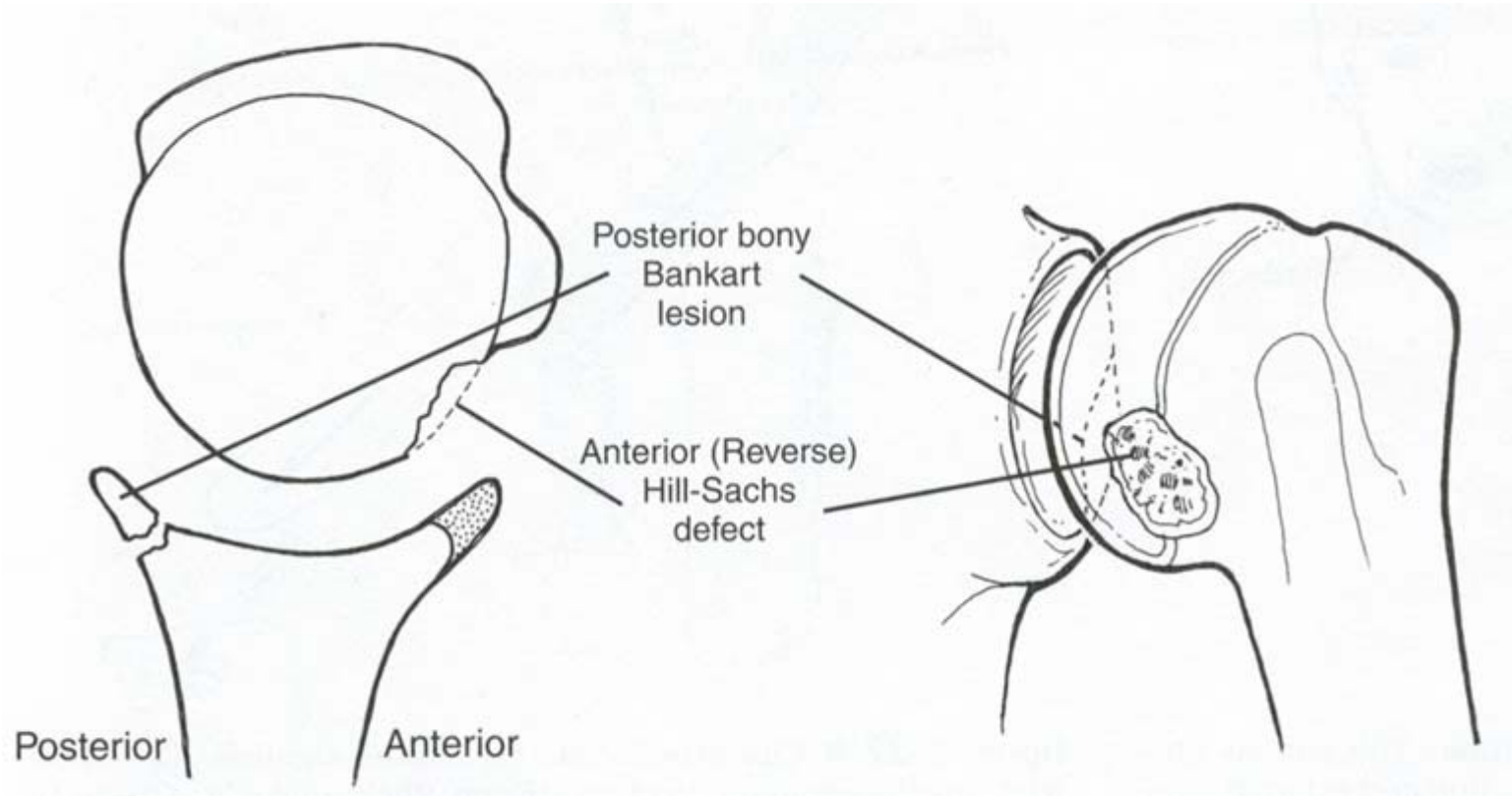


Bony Bankhart Lesion

Associated Injuries

Associated fractures:

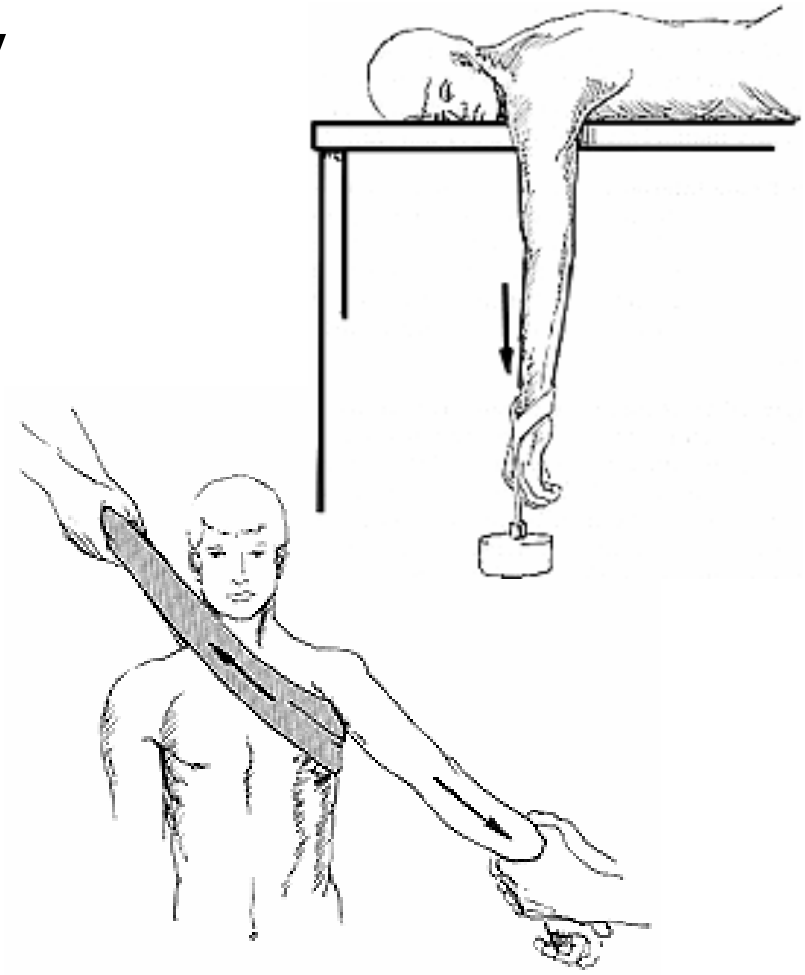
- **Reverse Hill - Sachs defect (hatchet - shaped anterior humeral head impression fracture)**
- **Reverse Bankart lesion (posterior glenoid rim)**
- **Lesser tuberosity fracture**


Posterior bony
Bankart
lesion
Anterior (Reverse)
Hill-Sachs
defect
Posterior
Anterior

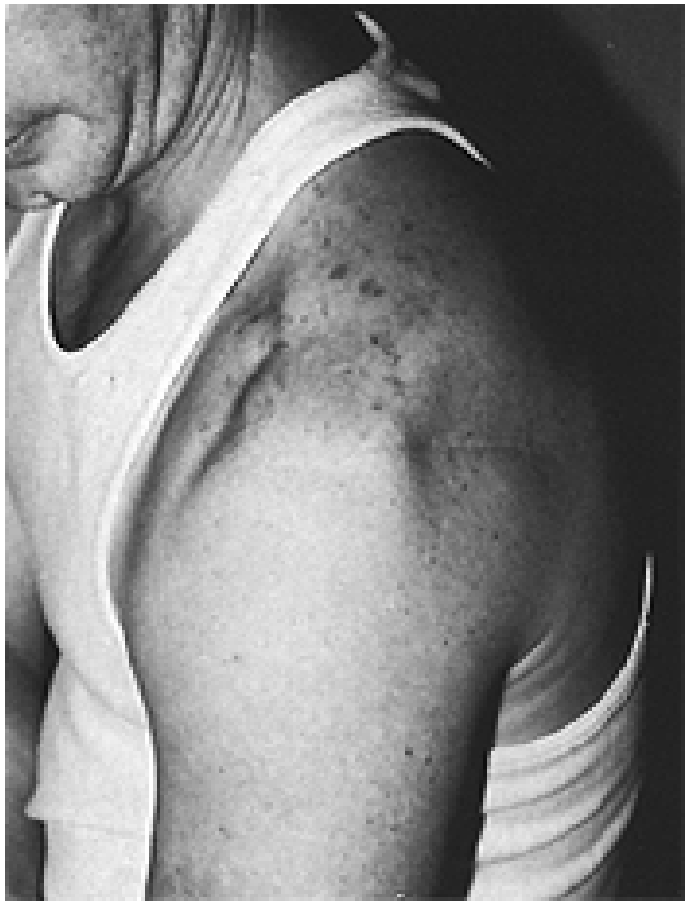
Dislocations/Separations

Treatment for Acutely

- **Reduction**
- **Sling/Immobilizer x 4-6 wks**
- **Physical Therapy**

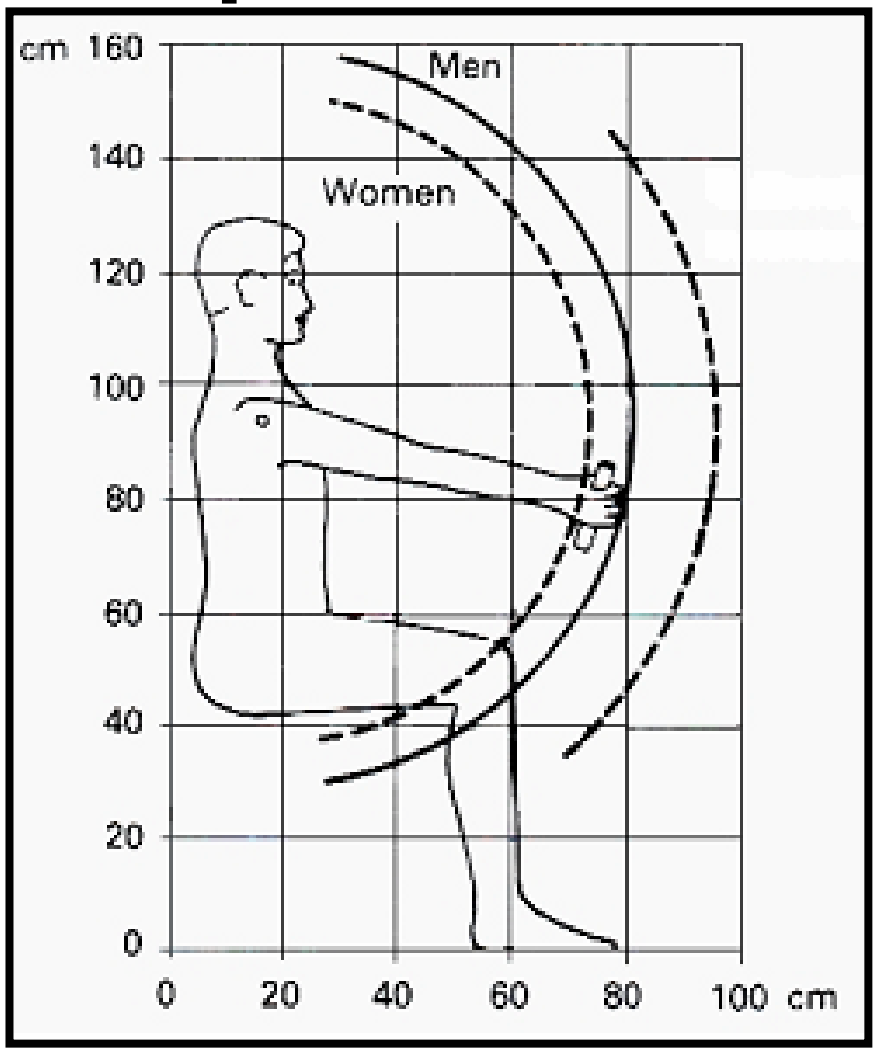


Dislocations/Separations



Dislocations/Separations

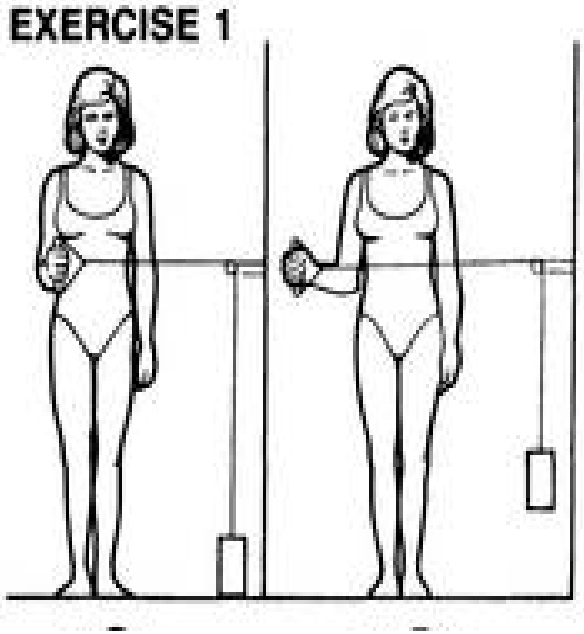
- Physical Therapy
  - Acutely
    - Codman's Exercises
    - Wand Exercsies

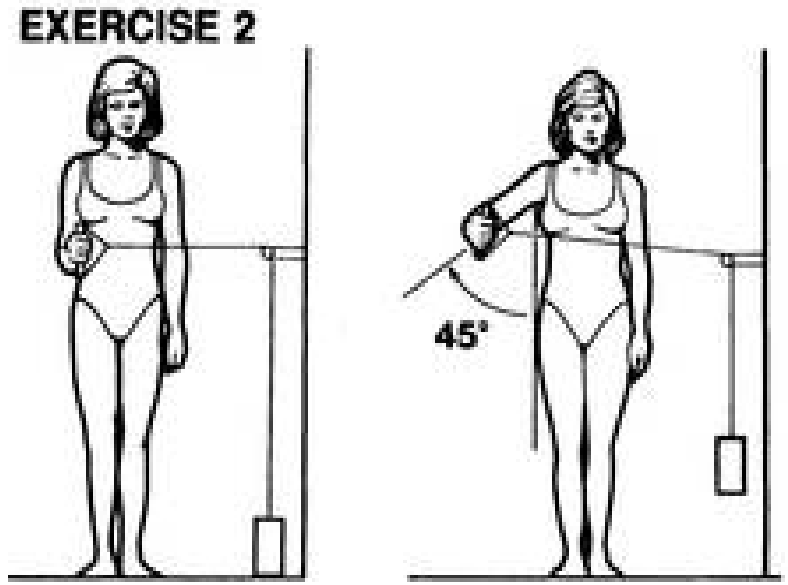


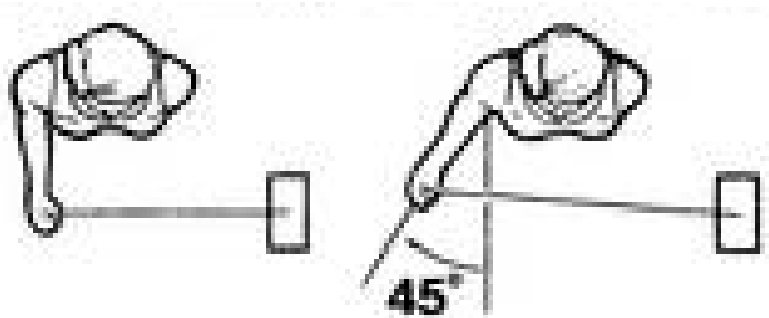
Dislocations/Separations

- **Physical Therapy**
  - **Rotator Cuff Strengthening Exercises**

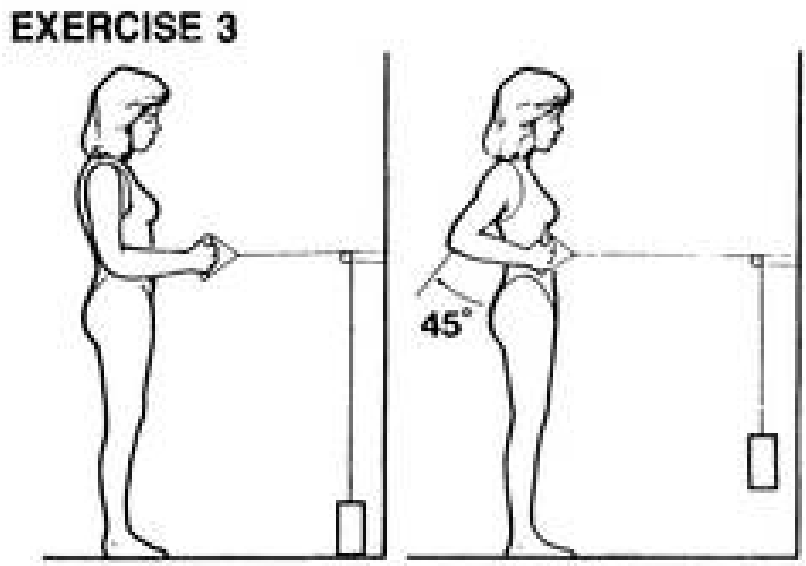
Physical Therapy Exercises

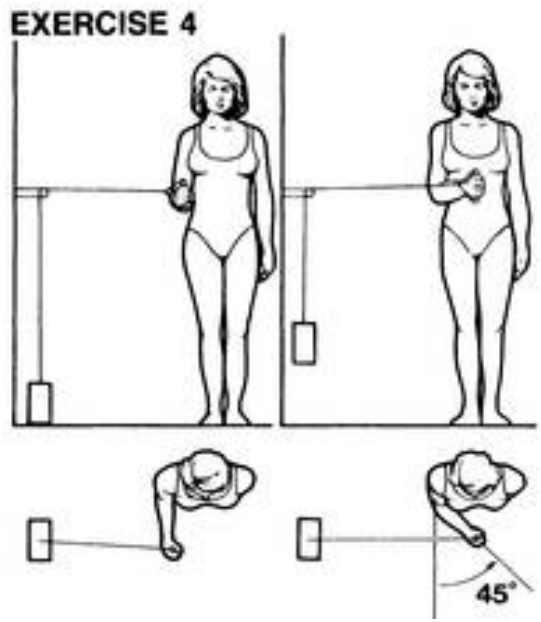


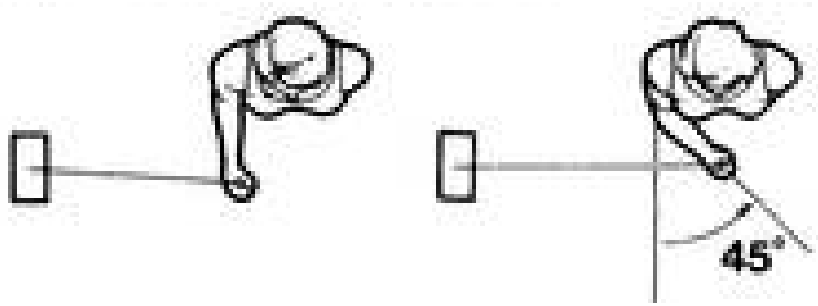




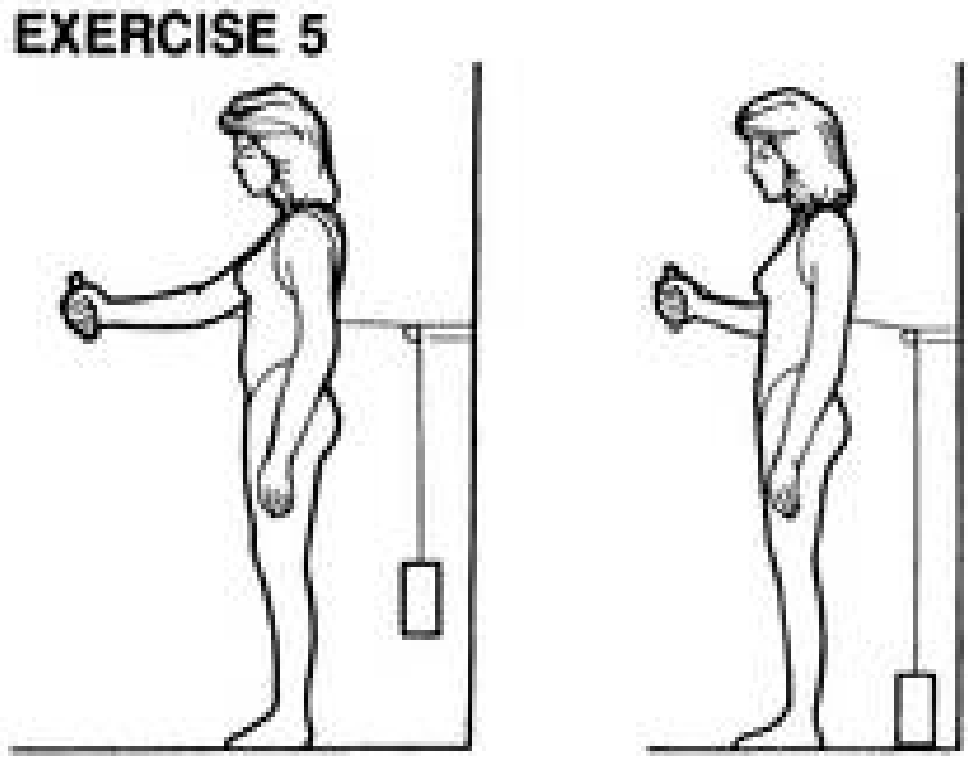
Physical Therapy Exercises







Physical Therapy Exercises



Dislocations/Separations

Prognosis

- **If pt's age is < 30, redislocation rate is higher…….Surgery**
- **If pt's age is > 30, redislocation rate is lower…..Rehabilitation**

Dislocations/Separations

Following acute injury -- Treatment based on many factors that relate to surgery

- **Atraumatic**
- **Age (>35, 1st time dislocator generally does well with strengthening exercises)**

Dislocations/Separations

Additional factors include:

- **Multidirectional vs Unidirectional**
- **Activity level**
- **Symptoms**

Dislocations/Separations

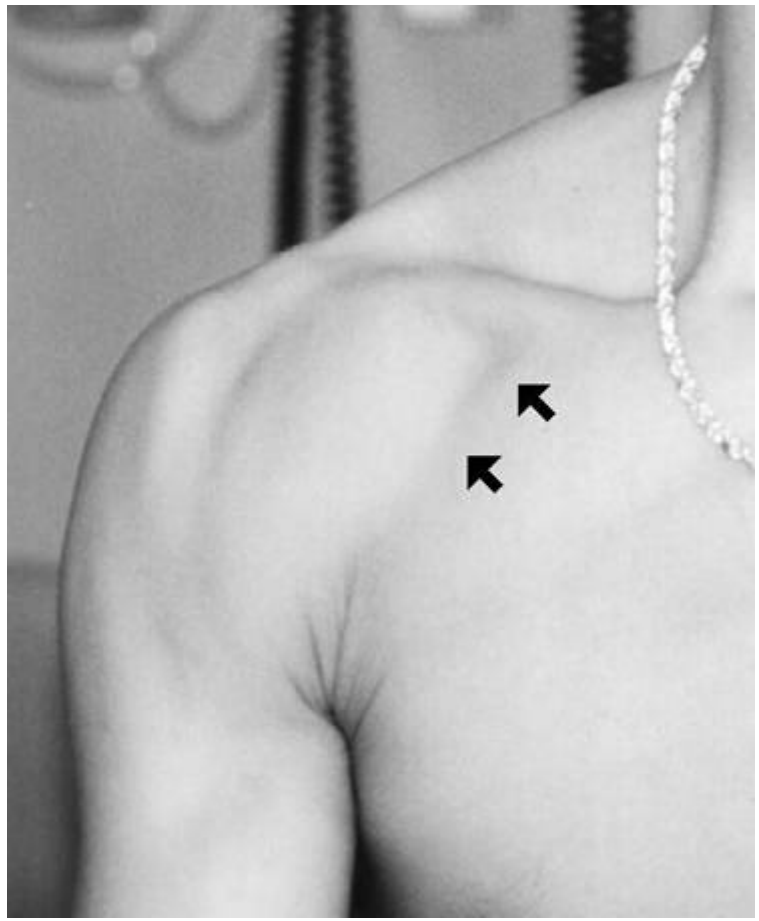
- TX -- Surgical
  - Arthroscopic
    - Bankhart repair
    - Capsular shift
  - Open
    - Bankhart repair
    - Capsular shift
    - Usually a combination

Anterior Dislocation

Mechanism of Injury

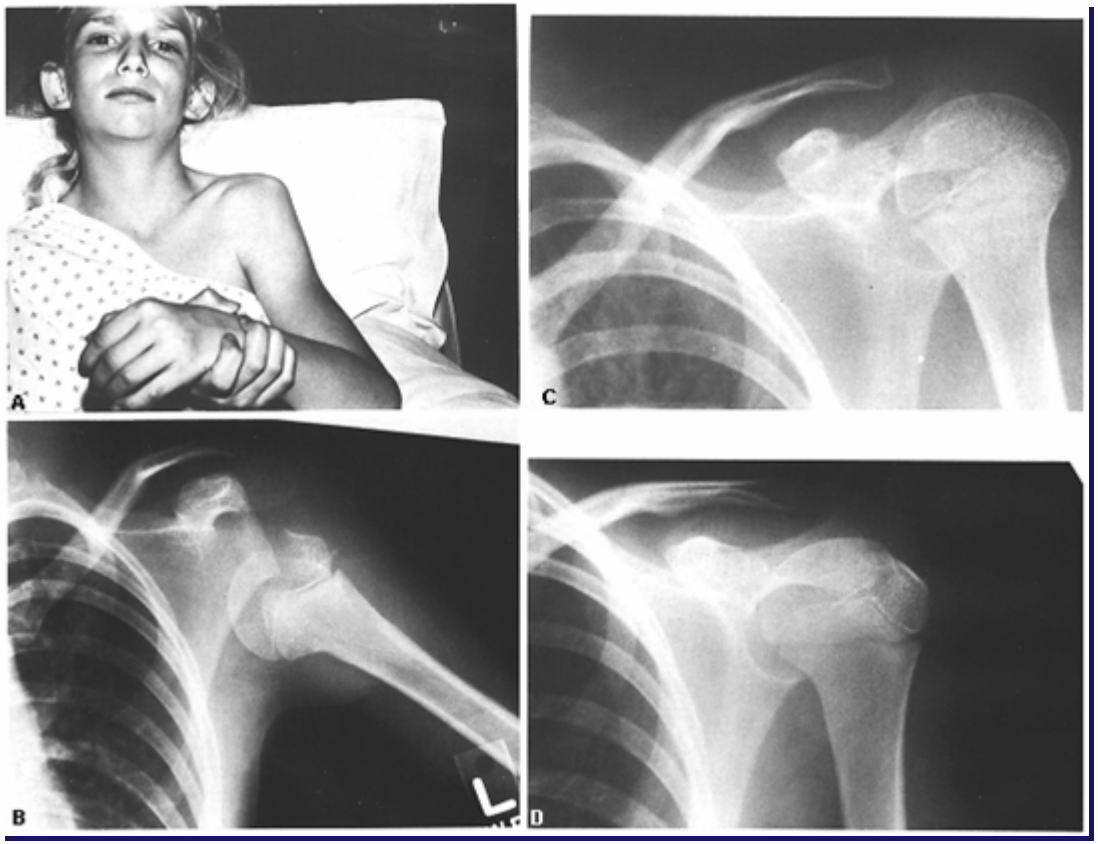
- **Forced abduction and rotation**

Signs/Symptoms – Acute Pain, flattened Deltoid, anterior fullness, natural splinting, short squared shoulder



Anterior Dislocation

Radiology- True AP, Axillary lateral or West Point and Scapular Y views



Anterior Dislocation

Special tests

- **+ Anterior drawer/ translation**
- **+ Apprehension test**
- **+ Reduction/ release test**

Anterior Dislocation

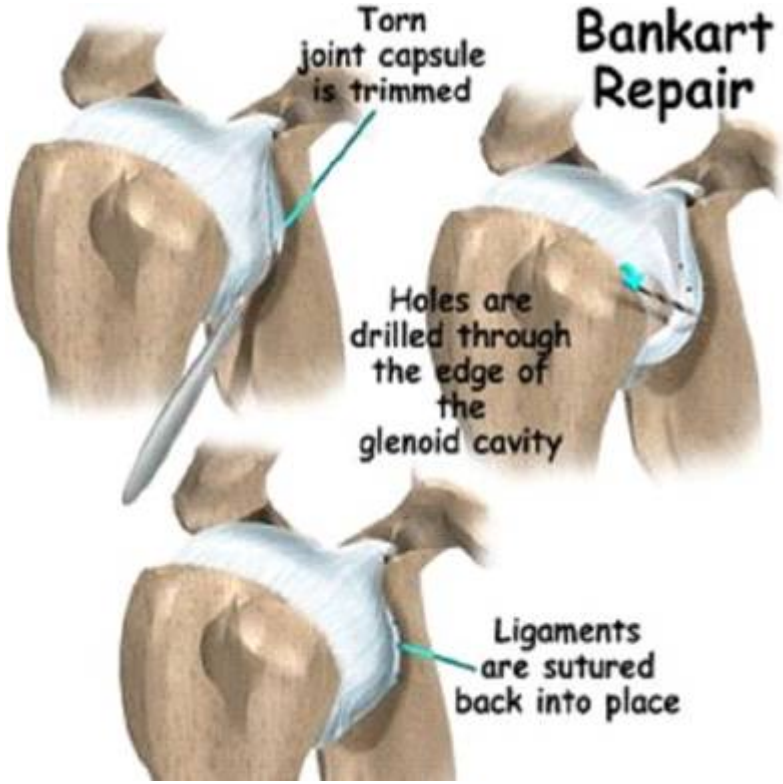
Treatment

- **Immediate reduction**
- **Ice, rest**
- **NSAIDs, ASA, Tylenol®**
- **Shoulder Immobilizer or Sling & Swathe**
- **PT - early gentle ROM**

Anterior Dislocation

Treatment -- Surgical

- **Arthroscopic**
  - **Bankhart repair**
  - **Capsular shift**
- **Open**
  - **Bankhart repair**
  - **Capsular shift**
  - **Usually a combination**

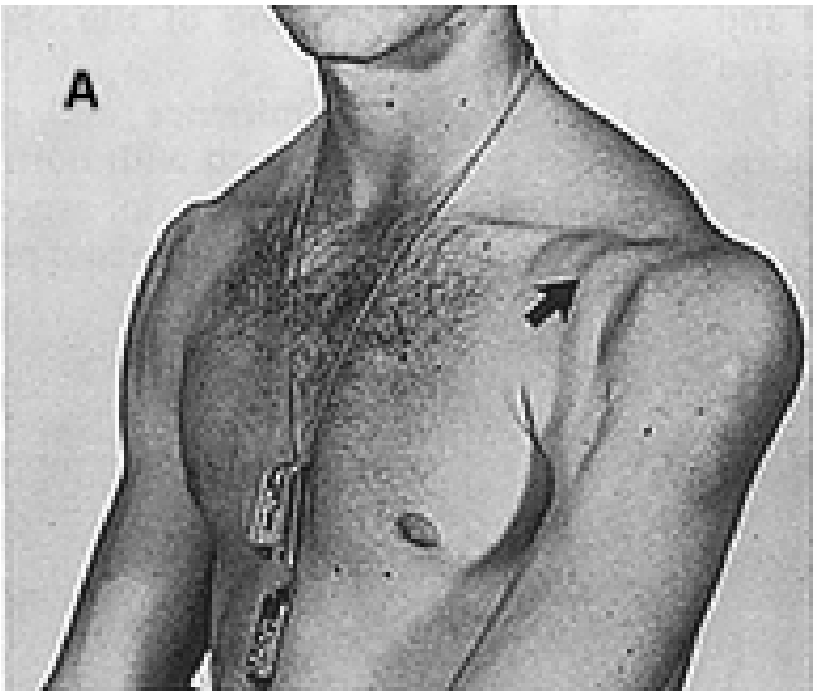


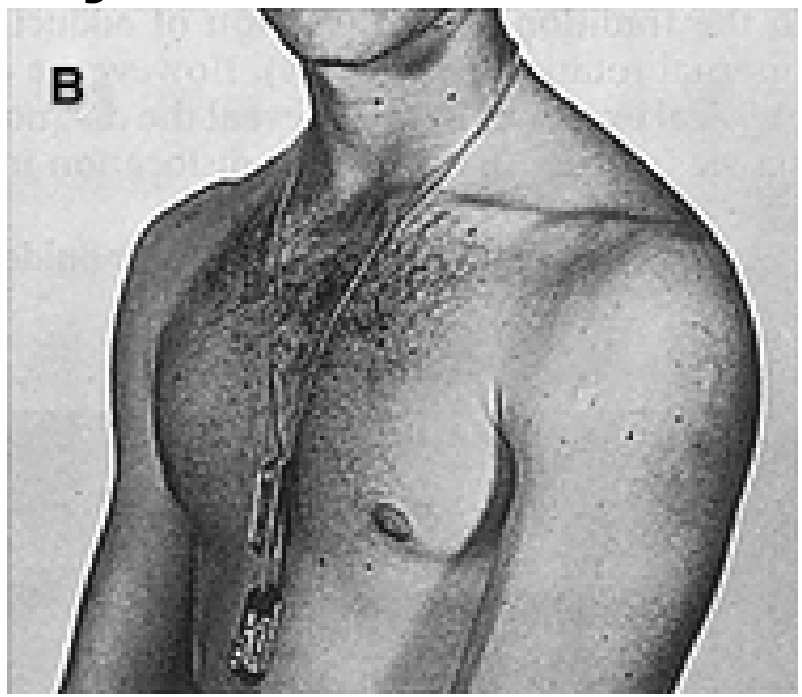
Posterior Dislocation

Mechanism of Injury - Fall on the adducted and internally rotated arm

Posterior Dislocation

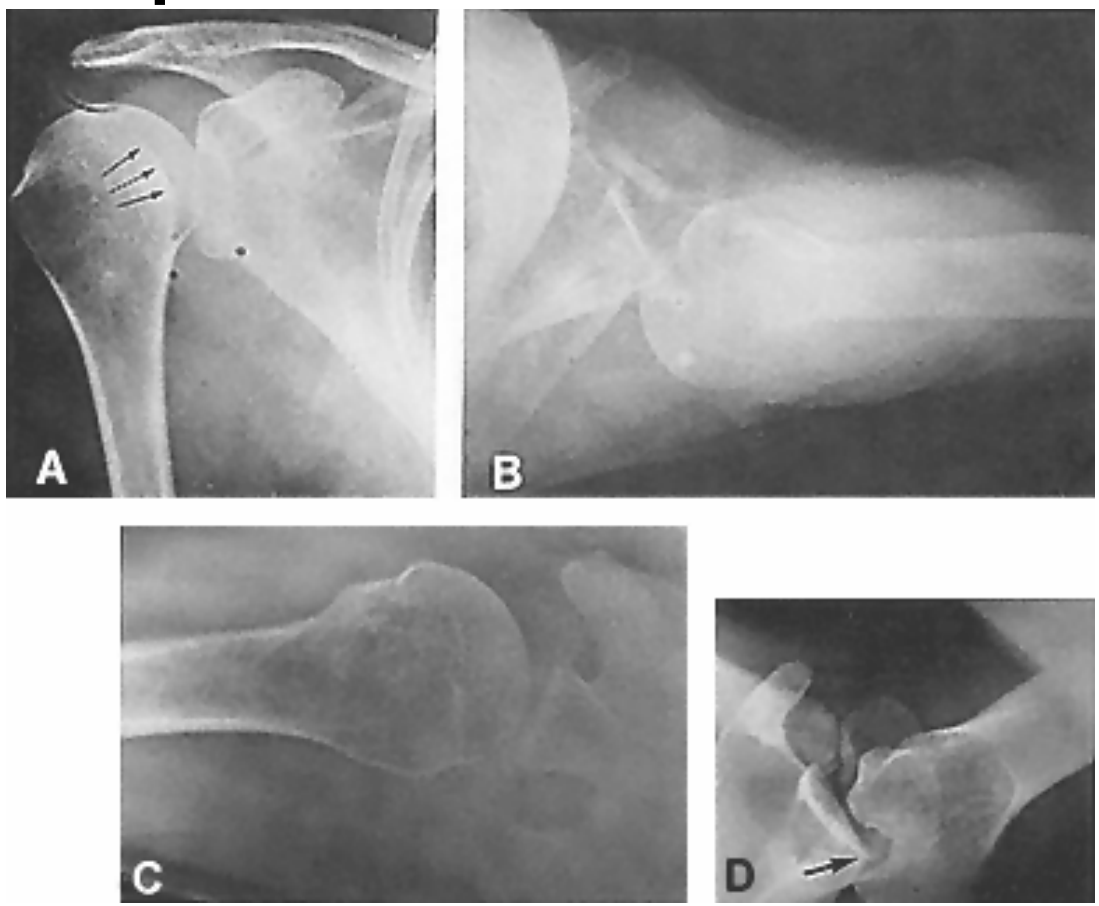
Signs/Symptoms - Severe Acute Pain, Prominent Coracoid Process, Arm will be adducted, internally rotated





Posterior Dislocation

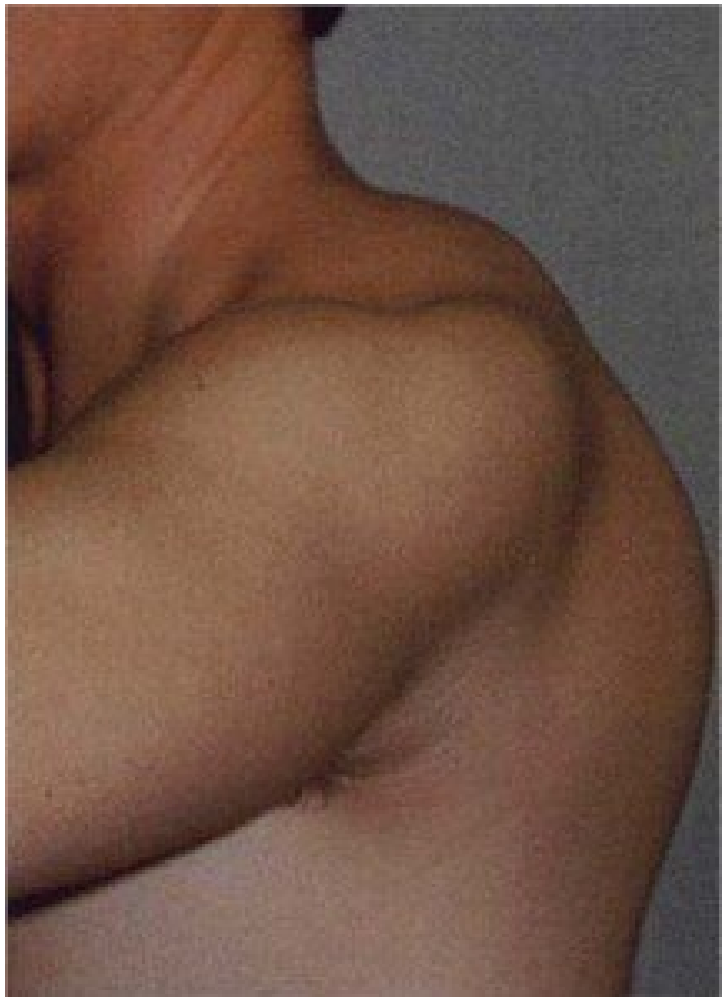
Radiology- Shoulder series will indicate head of humerus posterior to the labrum



Posterior Dislocation

Special tests

- **+ Jerk Test**
- **+ Reduction test**



Posterior Dislocation

Treatment

- **Immediate reduction**
- **Ice, rest**
- **NSAIDs, ASA, Tylenol®**
- **Shoulder Immobilizer or Sling & Swathe**
- **PT - early gentle ROM**

Posterior Dislocation

Treatment – Surgical

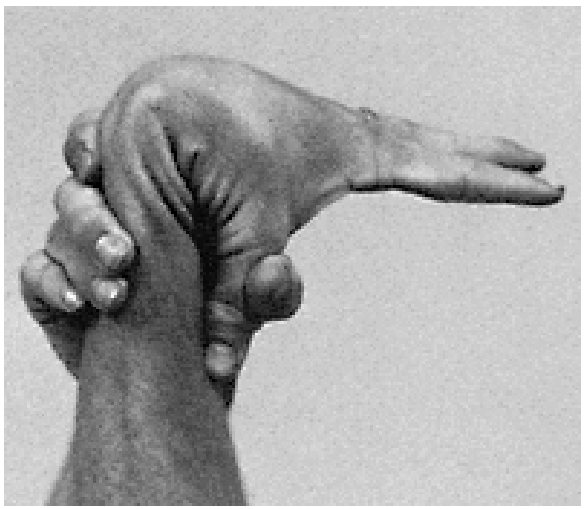
- **Arthroscopic**
  - **Reverse Bankhart repair**
  - **Capsular shift**
- **Open**
  - **Reverse Bankhart repair**
  - **Capsular shift**
  - **Usually a combination**

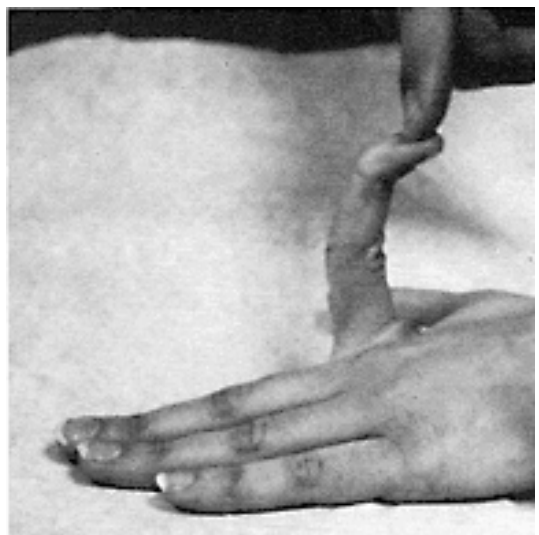
Inferior & Multidirectional Dislocation

Shoulder examination shows instability in multiple directions

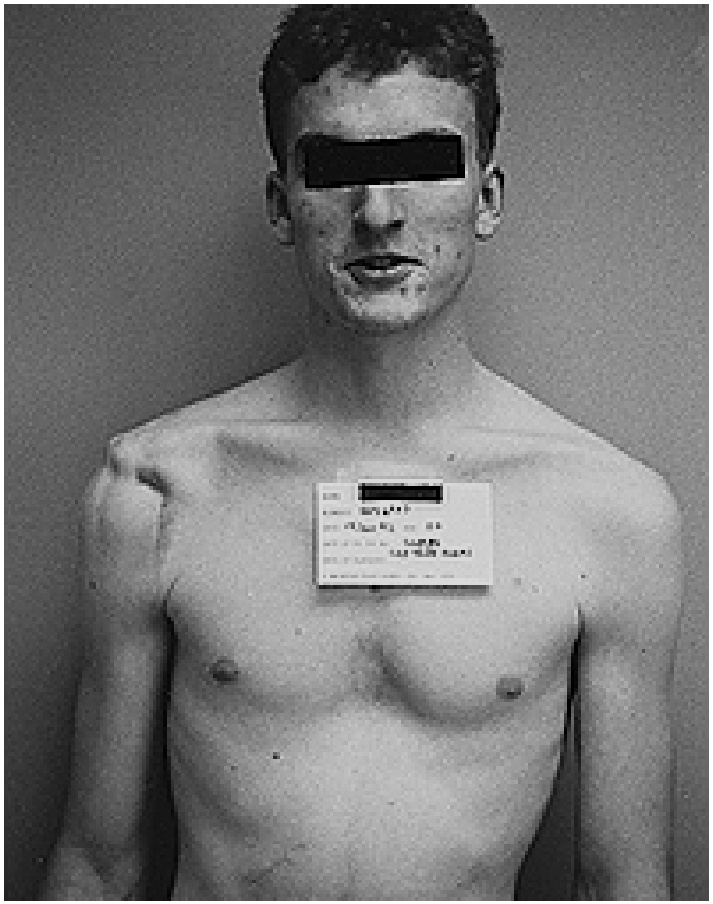
Patients often display hyperelasticity (MP joints, elbow, shoulder, etc.)

Inferior & Multidirectional Dislocation

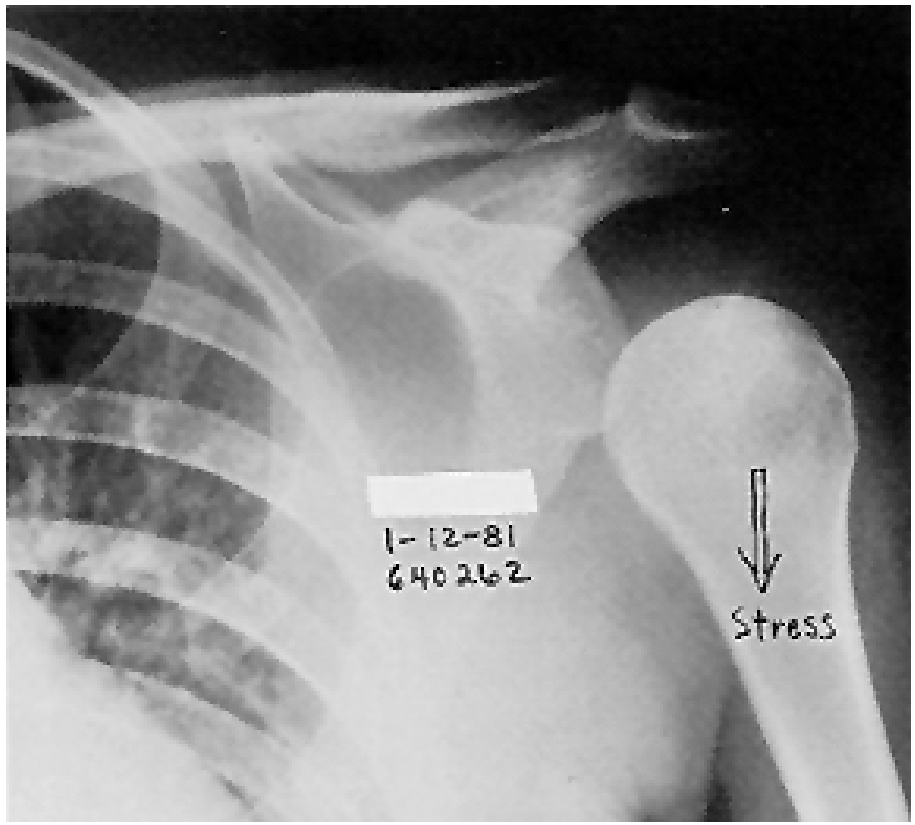




Inferior & Multidirectional Dislocation



Inferior & Multidirectional Dislocation



Inferior & Multidirectional Dislocation

Treatment

- **Nonoperative treatment favored**

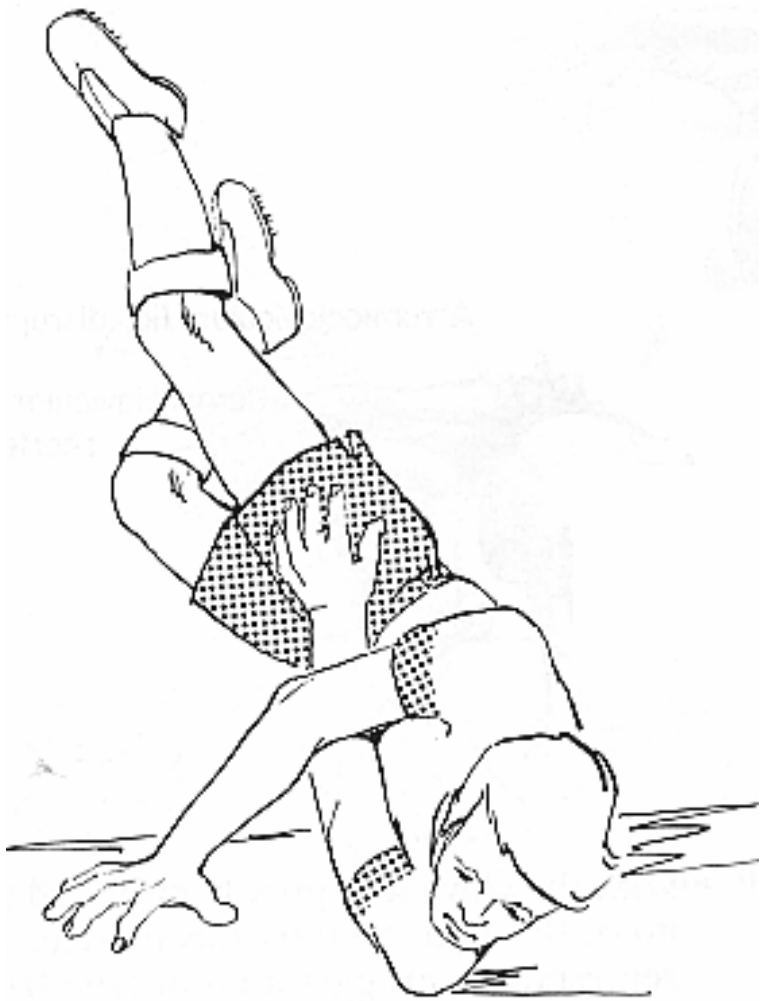
If Surgery – Capsular Shift

Acromioclavicular Separations

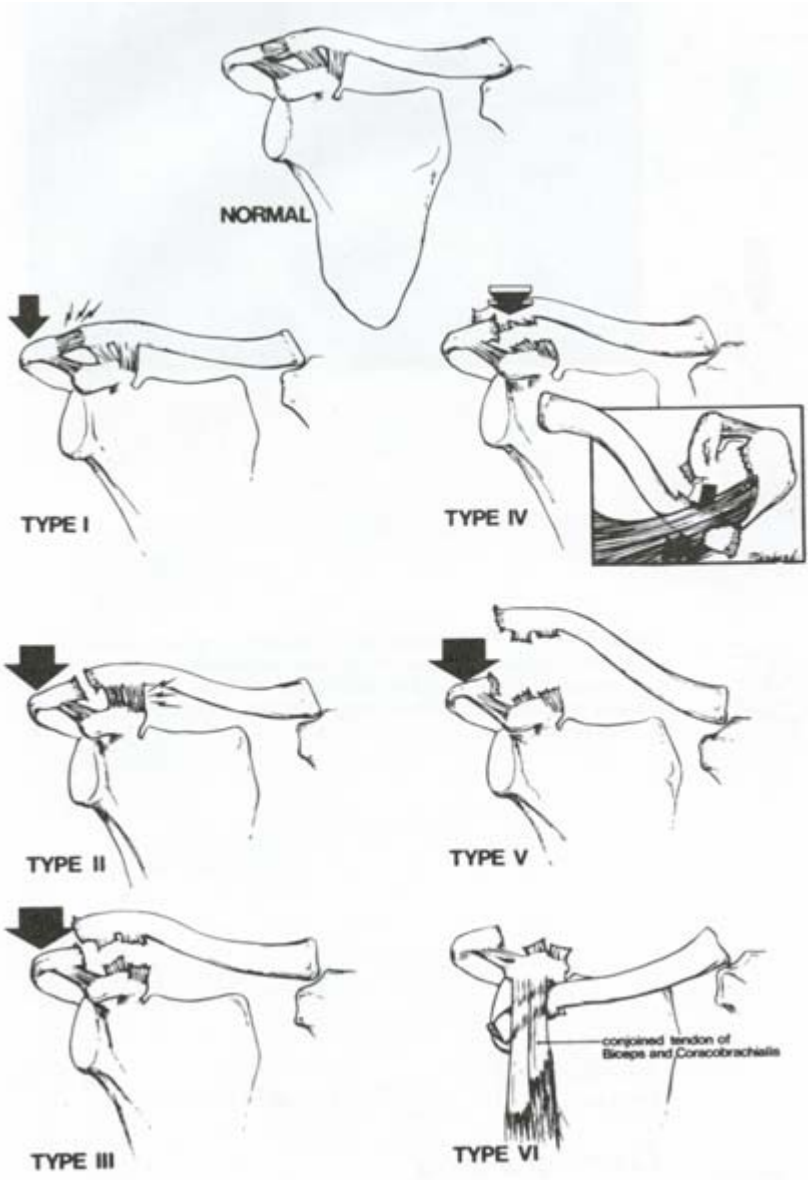
Acromioclavicular injuries (the so-called separated shoulder) can be classified into six types, and treatment is based on the specific type

A-C Separations

Mechanism of Injury: FOOSH or Fall onto the tip of the shoulder



A-C Separations



A-C Separations

Type I – AC ligament is partially disrupted; coracoclavicular (CC) ligament is intact

Type II – AC ligament is completely torn CC ligament is partially torn

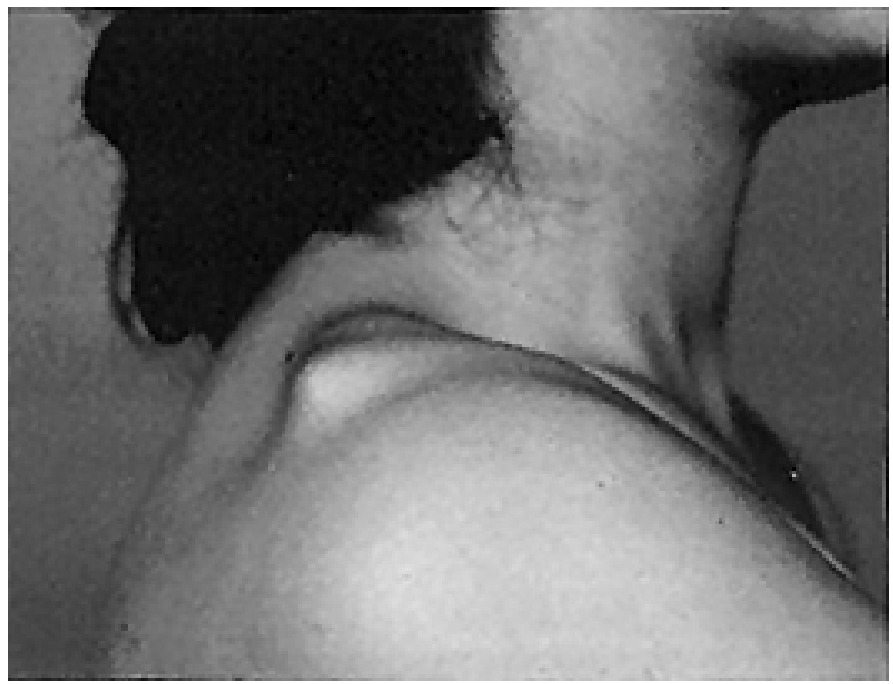
Type III – AC & CC ligaments are completely torn & there is complete separation of clavicle from the acromion.

Types IV – VI are uncommon

A-C Separations

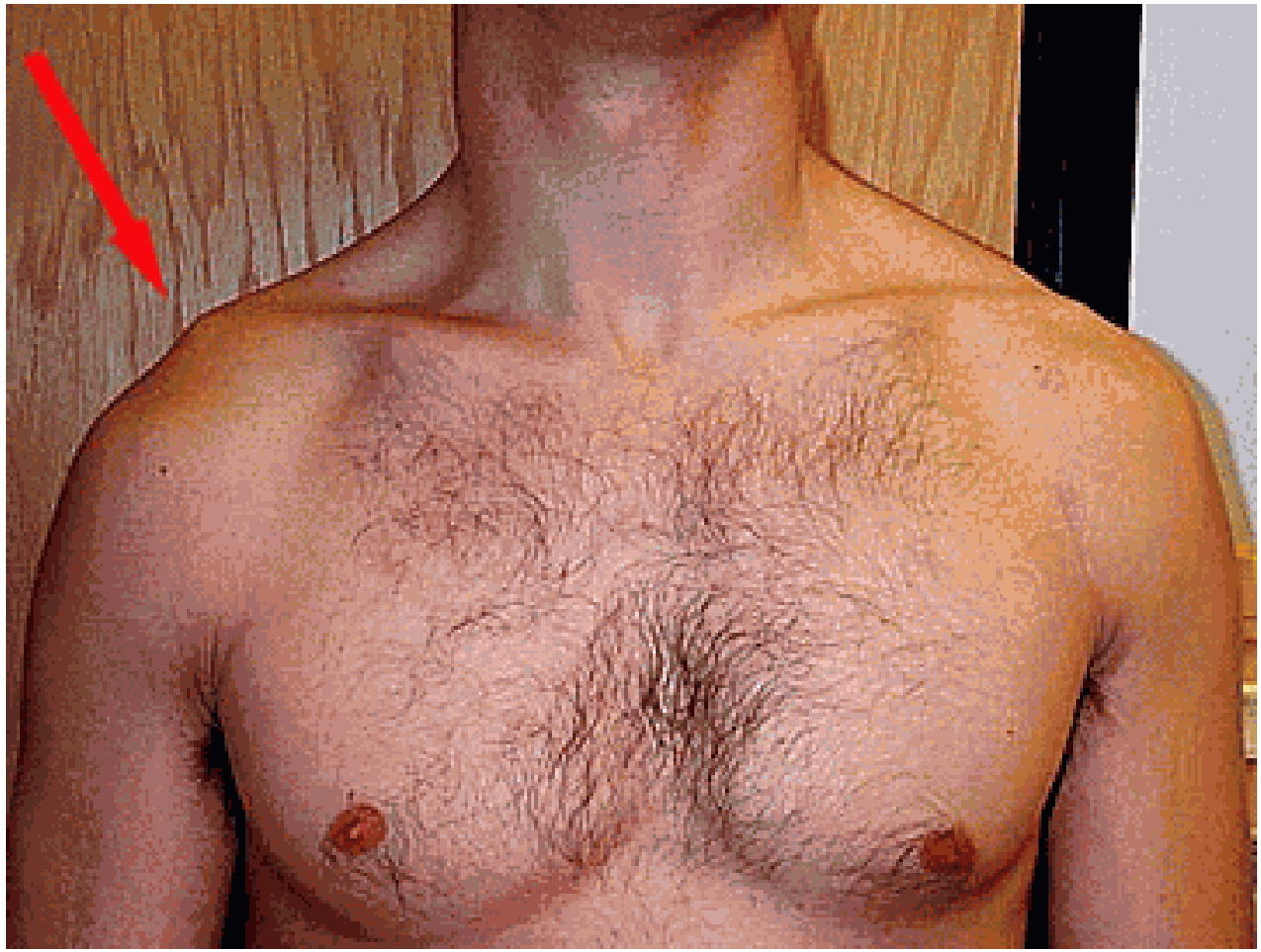
Signs and Symptoms

- Pain over A-C joint & lifting of the arm
- Swelling
- With Type III & higher…there is an obvious and cosmetically displeasing deformity



A-C Separations

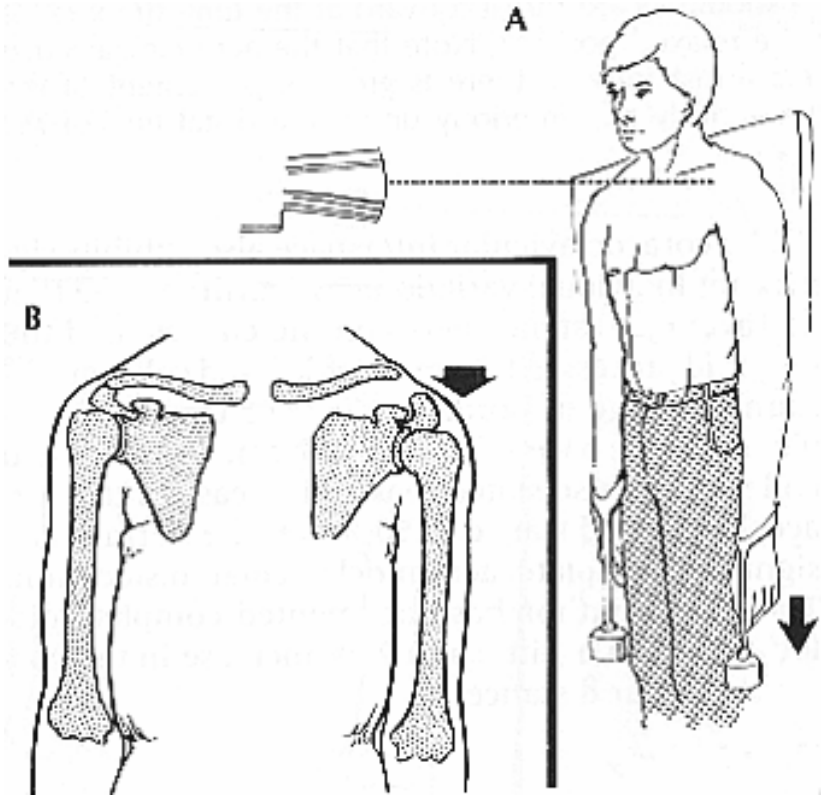
A-C Separations



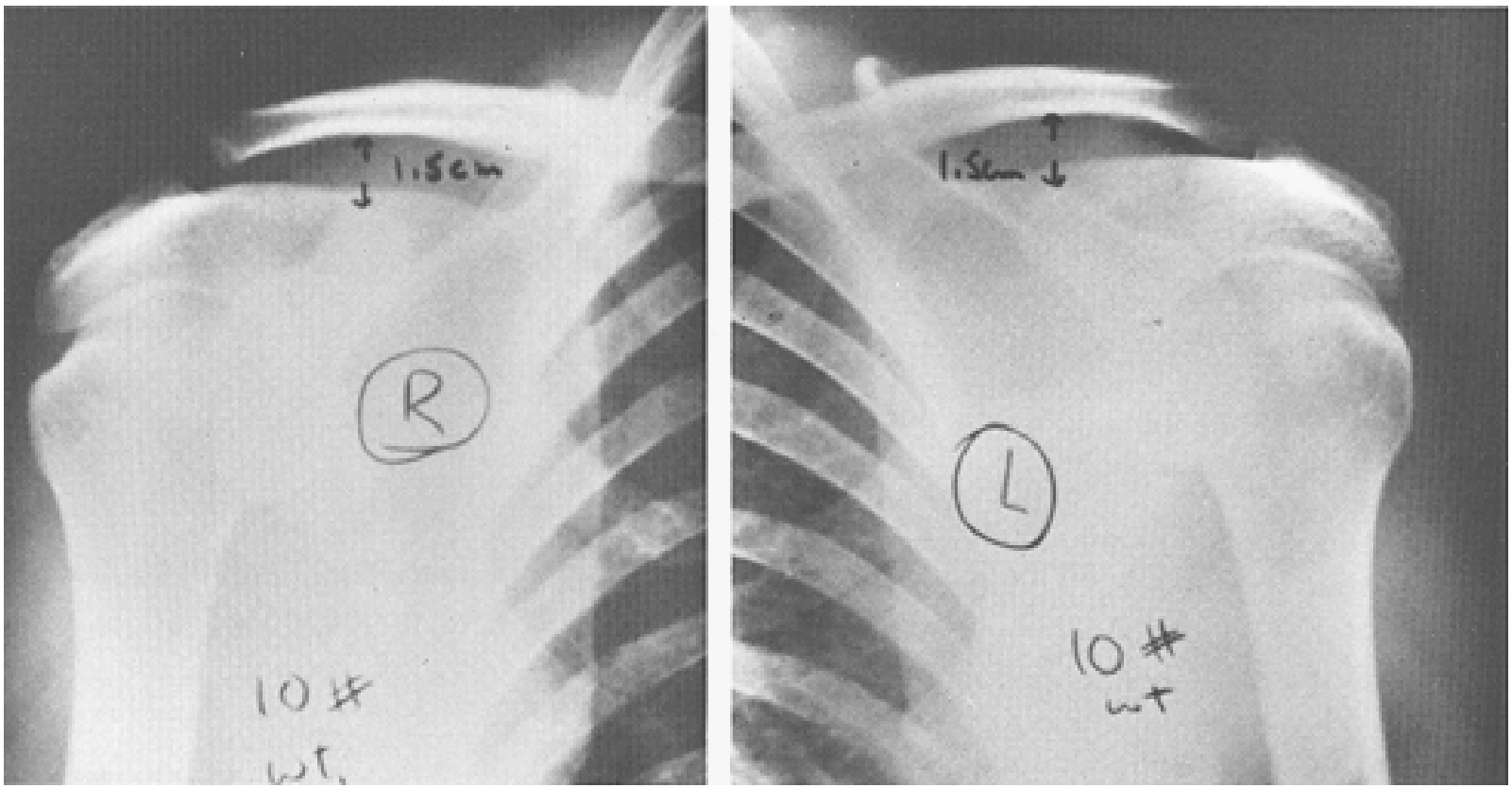
A-C Separations

Diagnosis

AP Xrays of both shoulders will confirm Type II or higher A-C separations (with & without weights)



A-C Separations



A-C Separations

Treatment

- **Type I & II:**
  - **Rest & Ice**
  - **Sling, Sling & Swath, Shoulder Immobilizer or Figure-of-8-clavicle brace X 4-6 Weeks**
  - **NSAIDs, ASA or Tylenol®**
  - **Analgesics esp. at night**

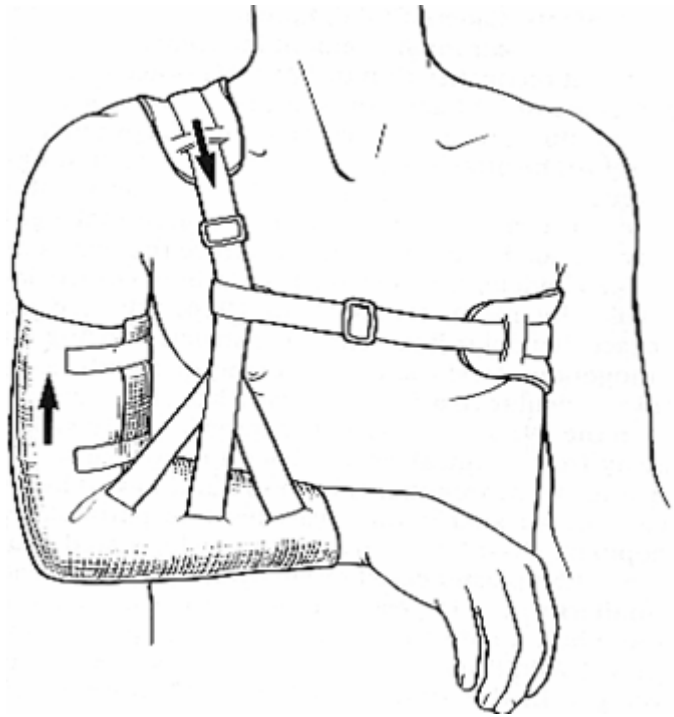
A-C Separations

Treatment

- **Type III is controversial – Most are treated nonoperatively with good results**

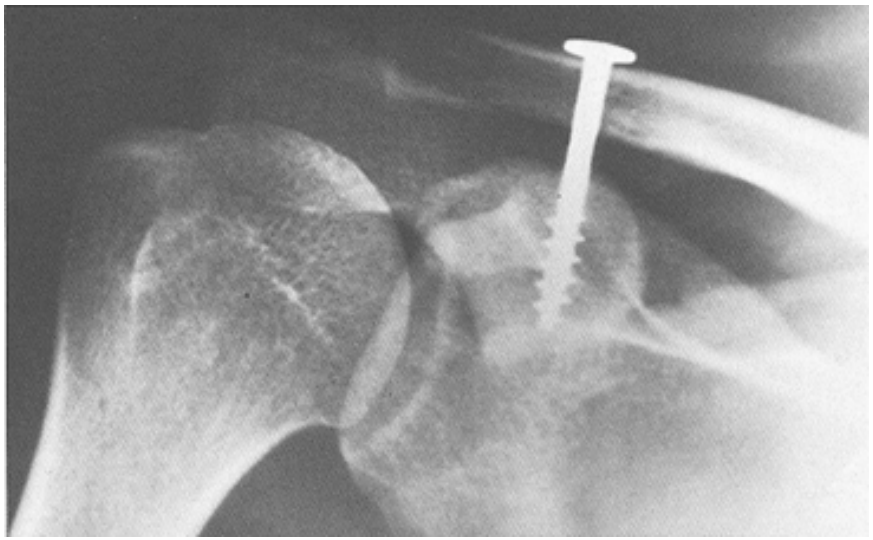
A-C Separations

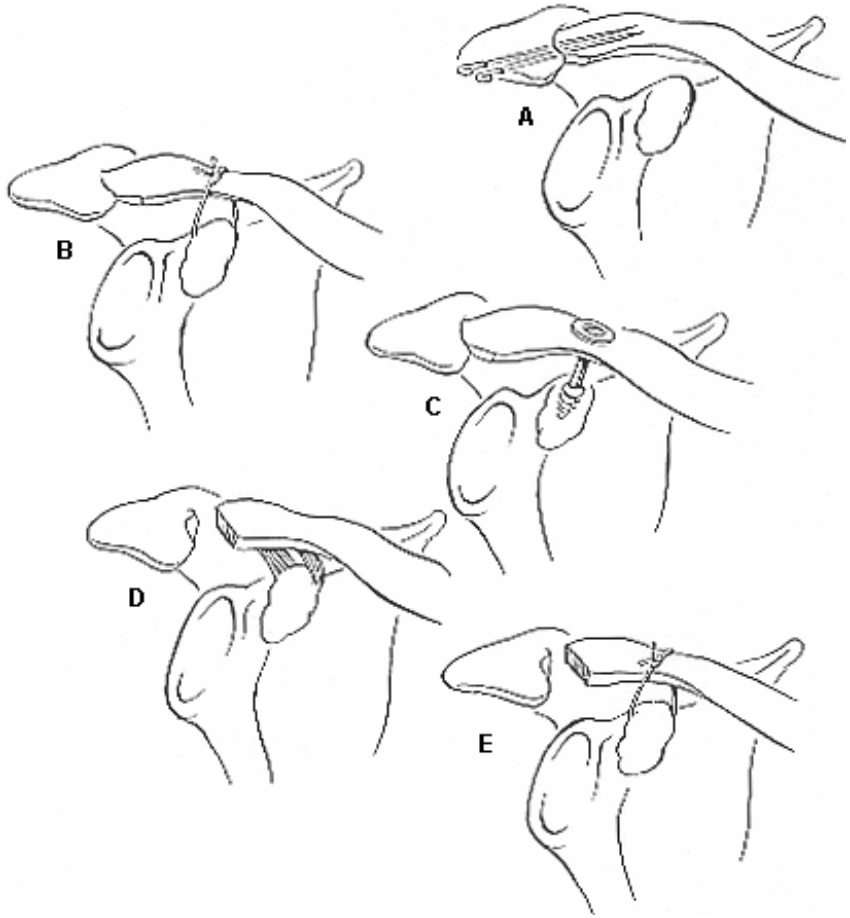
Immobilizing devices



A-C Separations

Surgical repairs





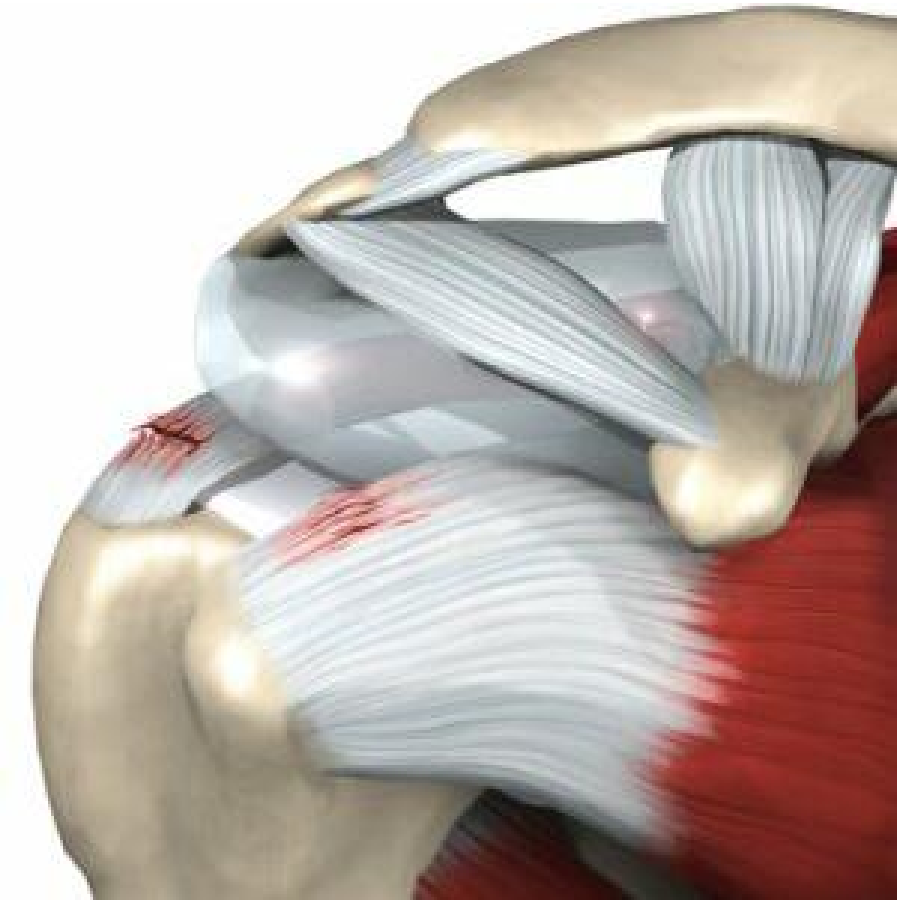
Rotator Cuff Syndrome

Definition: Rotator cuff syndrome or disease or impingement syndrome is a continuum of pathology starting with inflammatory changes in the sub acromial bursa and rotator cuff tendons, which may continue on to become a rotator cuff tendon rupture or tear……..

Rotator Cuff Syndrome

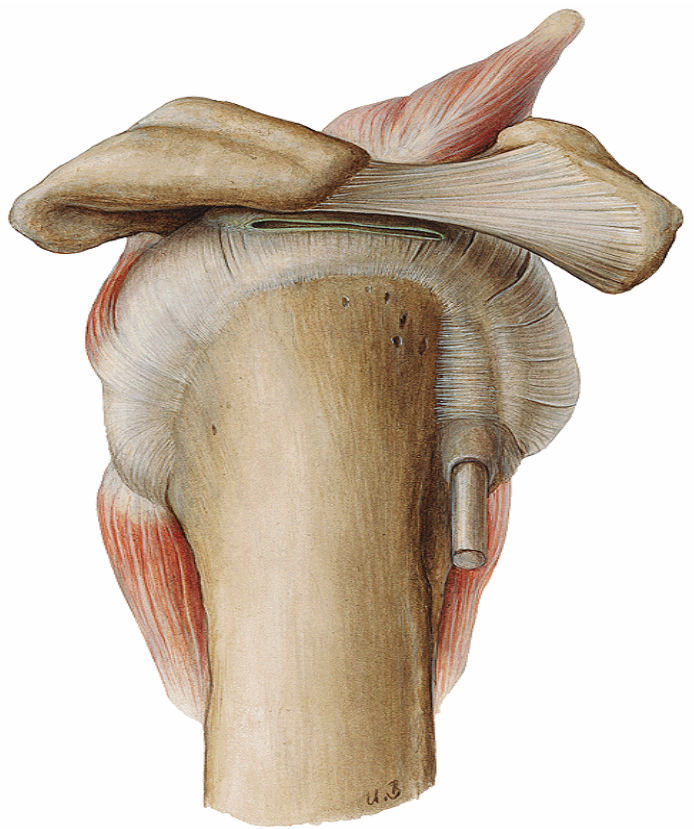
The rotator cuff is composed of four muscles: (SITS)

- **Supraspinatus**
- **Infraspinatus**
- **Teres Minor**
- **Subscapularis**



Rotator Cuff Syndrome

These muscles form a cover around the head of the humerus whose function is to rotate the arm and stabilize the humeral head against the glenoid



Rotator Cuff Syndrome

Rotator cuff disease primarily affects the Supraspinatus tendon

Signs and Symptoms

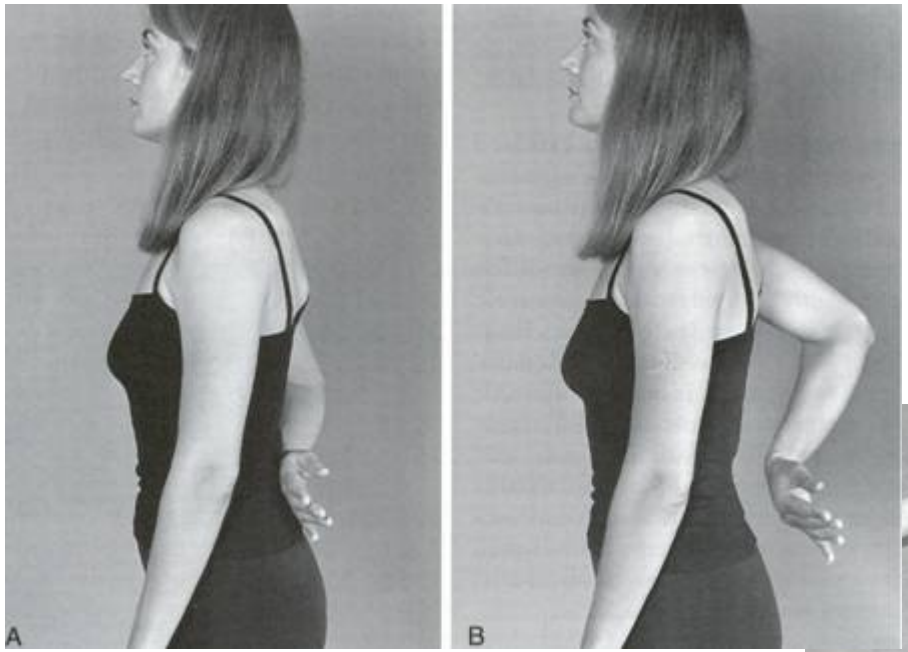
- **Pain, esp. at night**
- **Difficulty sleeping on it**
- **Weakness**
- **Catching**
- **Grating esp. with lifting the arm overhead**

Rotator Cuff Syndrome

Physical Exam

- **Tenderness over greater tuberosity or A-C joint**
- **Muscle Atrophy**
- **AROM is limited (esp. Abduction & IR) but PROM is usually normal <u>except</u> in patients with a frozen shoulder**

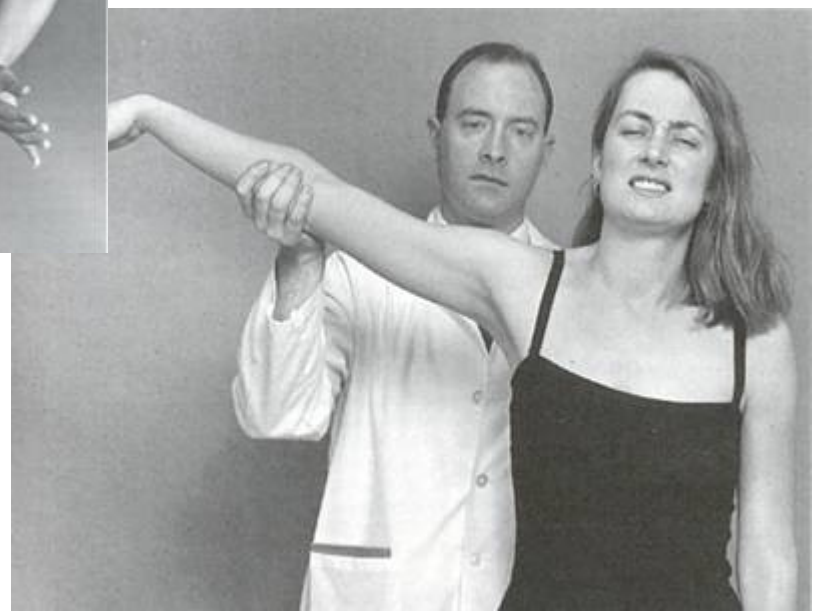
Rotator Cuff Syndrome



PE

+ Drop-arm test

+ Lift-off test

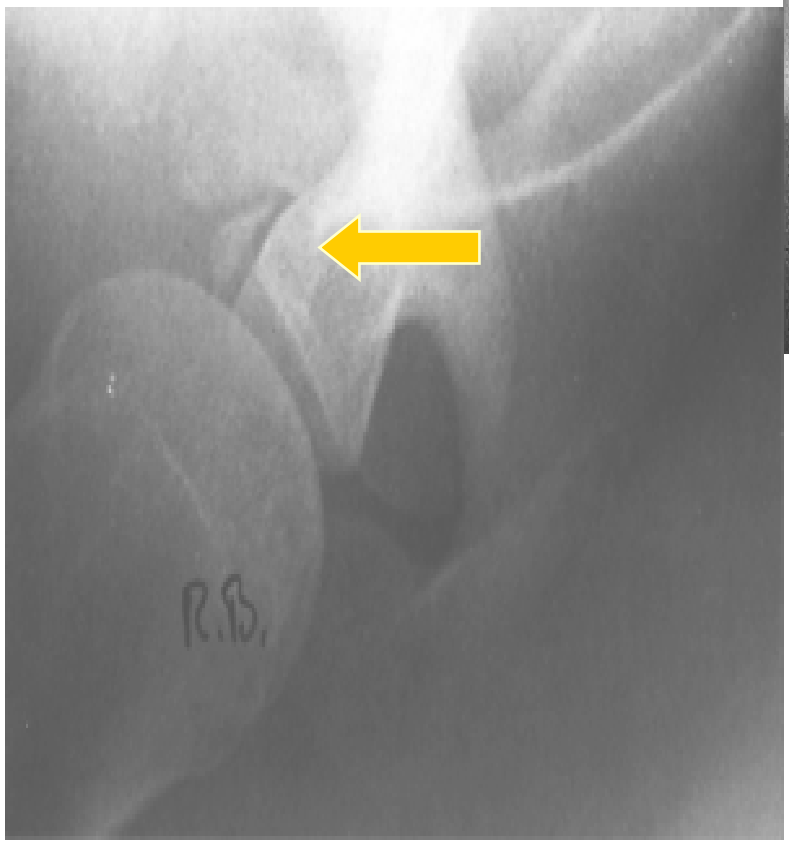


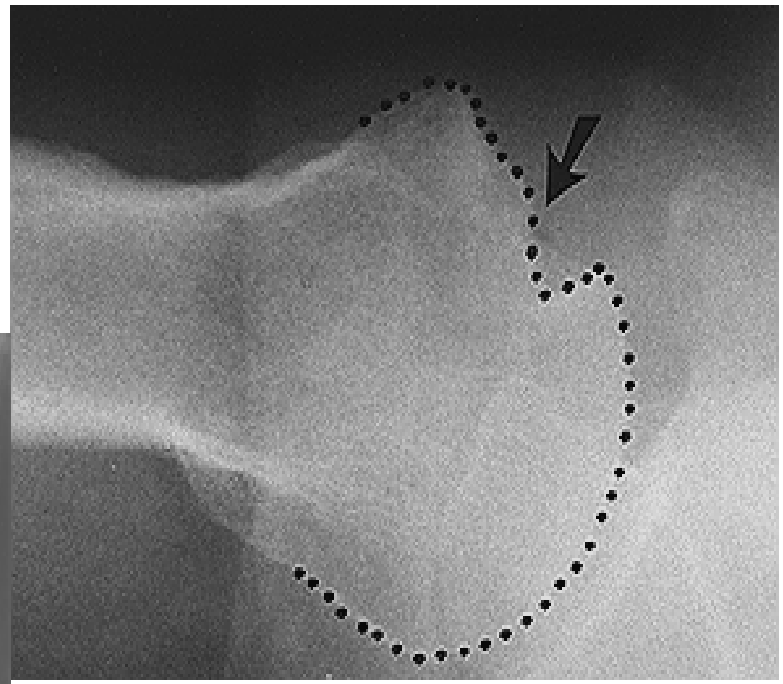
Rotator Cuff Syndrome

Diagnosis

- Xrays are usually normal unless DJD changes are present or in trauma
  - Osteophytes
  - Calcific changes within the tendon
  - A-C joint DJD

Rotator Cuff Syndrome





Hill-Sachs Lesion

Bony Bankhart Lesion

Rotator Cuff Syndrome

Treatment: Conservative

- **Rest, Ice & Passive ROM ex's**
- **NSAIDs**
- **PT: strengthening esp. rotator cuff muscles**

Rotator Cuff Syndrome

Treatment: Conservative

- **Avoid overhead and painful activities**
- **Steroid injection should be used with caution (may decrease inflammation, provide pain relief, but steroid injections weakens tendon)**

Rotator Cuff Syndrome

Treatment: Surgical

- **Arthroscopic**
- **Open**

Rotator Cuff
Post-Surgery

Rotator Cuff
Pre-Surgery

Impingement Syndrome

Impingement between the rotator cuff tendons and subacromial bursa between the humeral head, greater tuberosity and the acromion occurs when the arm is elevated. This causes inflammation and edema and therefore increased impingement, in a self-perpetuating cycle……

Impingement Syndrome Classification

Stage I: Pt's < 25 with reversible edema & hemorrhage

Stage II: Pt's 25 – 40 with fibrosis, tendonitis & recurring pain with activity

Stage III: Pt's > 45 with bone spurs or osteophytes & rotator cuff tendon rupture

Impingement Syndrome

Differential Diagnosis

- **Subacromial Bursitis**
- **Supraspinatus Tendonitis**
- **A-C Arthritis**
- **Bicipital Tendonitis**
- **Calcific Tendonitis**
- **Adhesive Capsulitis**
- **Thoracic Outlet Syndrome**

Subacromial Bursitis

Signs and Symptoms

- Inability to use the arm in the overhead position (Flexed & Internally rotated or Abduction) due to pain, stiffness, weakness & catching
- Pain with sleeping on the affected side
- Pain in the acromial area

Subacromial Bursitis

Physical Exam

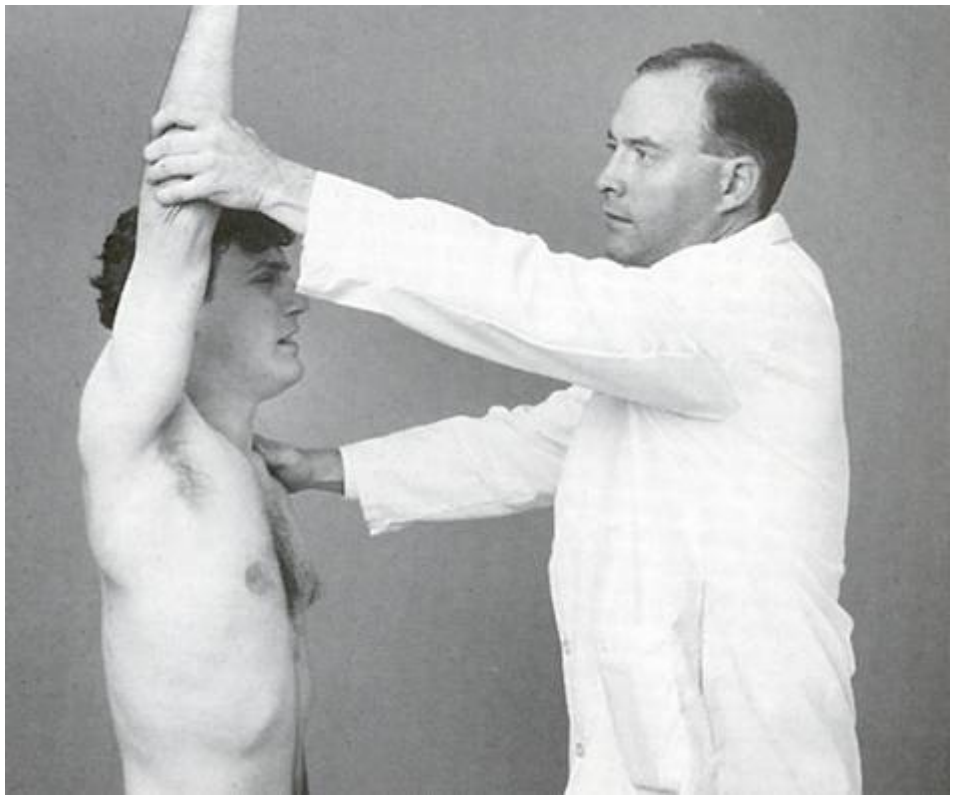
- **+ Neer Impingement Sign**
- **+ Hawkins Impingement Sign**
- **+ Impingement Sign**

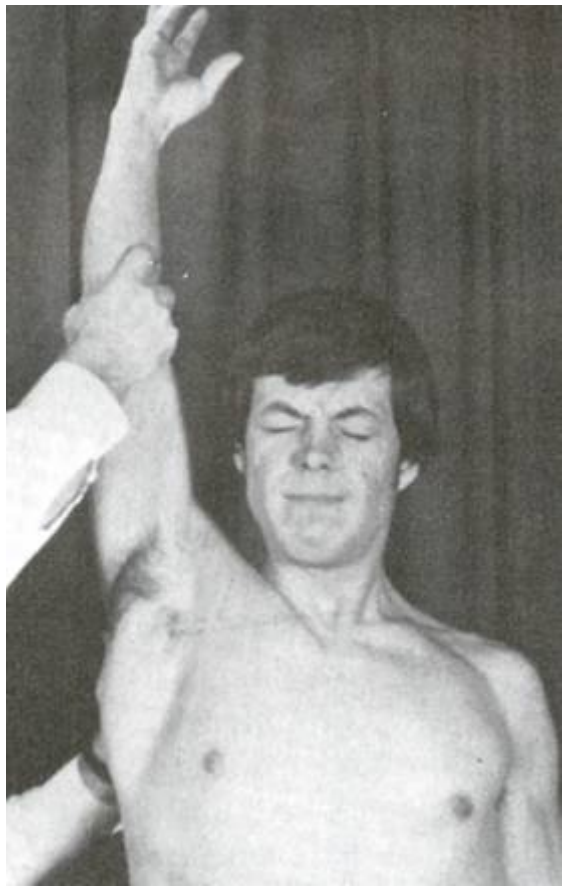
Differential Diagnosis

- **Impingement Test**

Subacromial Bursitis

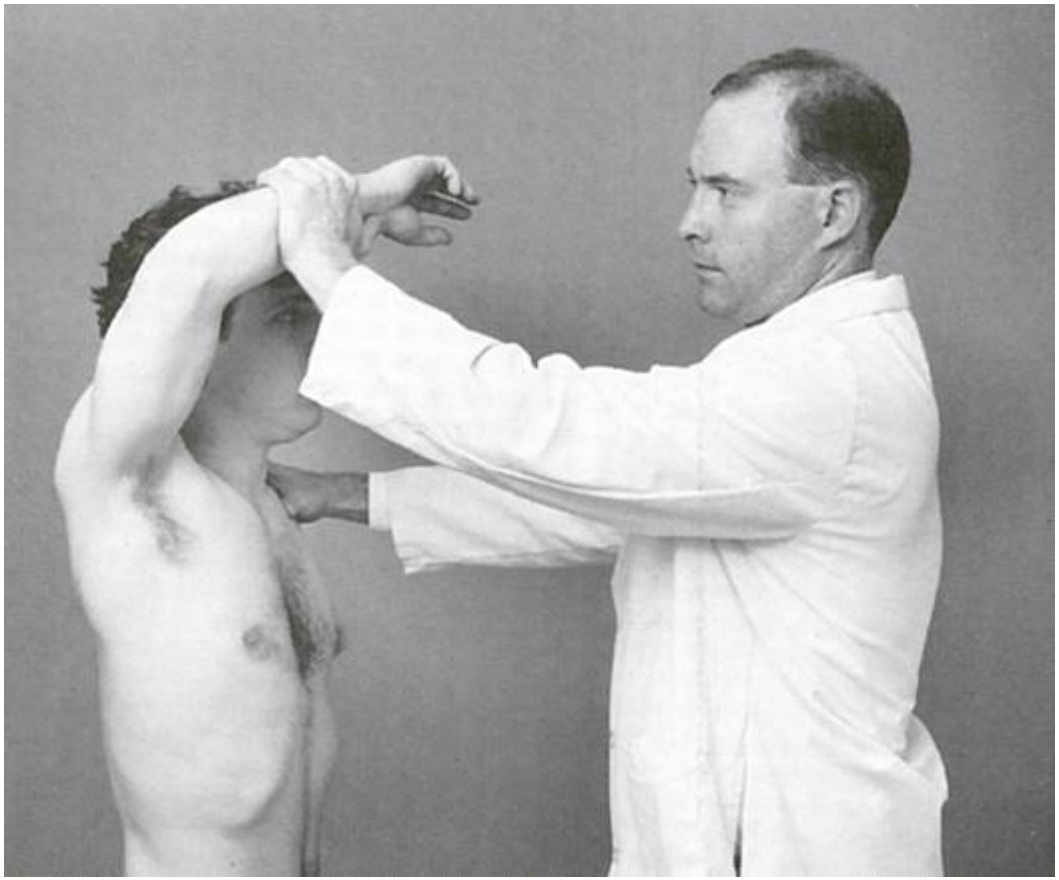
+ Neer Impingement Sign





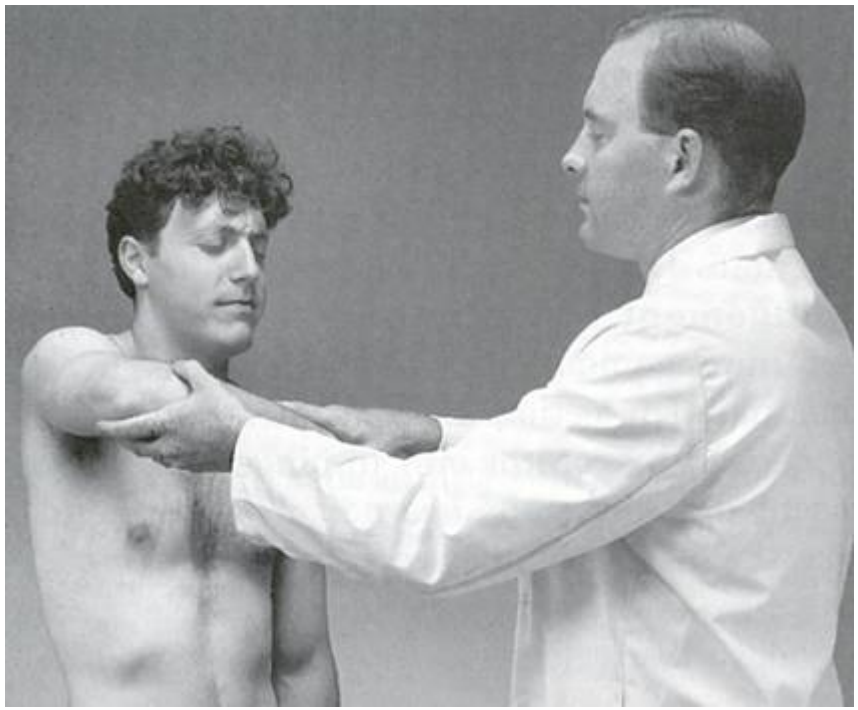
Subacromial Bursitis

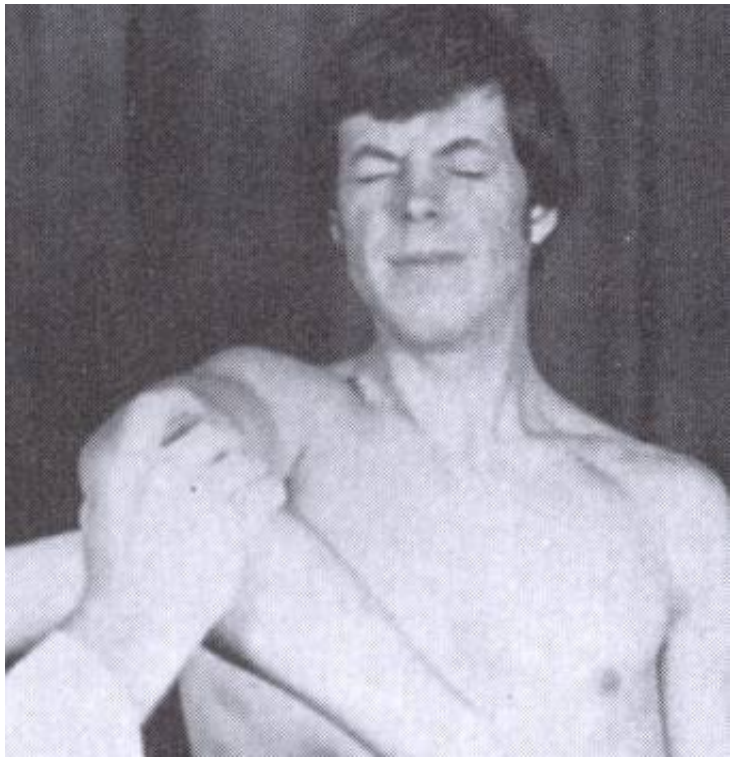
+ Modified Neer Impingement Sign



Subacromial Bursitis

+ Hawkins Impingement Sign





Subacromial Bursitis

Impingement Test – instill 10cc 1% plain local anesthetic into the subacromial space followed by impingement testing

Subacromial Bursitis

Complete pain relief supports a diagnosis of impingement syndrome

To demonstrate supraspinatus weakness compare using the supraspinatus test – If initially patient was weak but strong post injection then inflammation & fibrosis is consistent vs rotator cuff tear

Subacromial Bursitis

TX: Conservative

- **Rest & Ice**
- **Avoidance of overhead activities**
- **PT (ROM ex's & Rotator cuff strengthening ex's)**
- **Ultrasound/Phonophoresis/ Iontophoresis**
- **NSAIDs, ASA or Tylenol®**
- **Corticosteroid injections**

Subacromial Bursitis

Treatment: Surgical

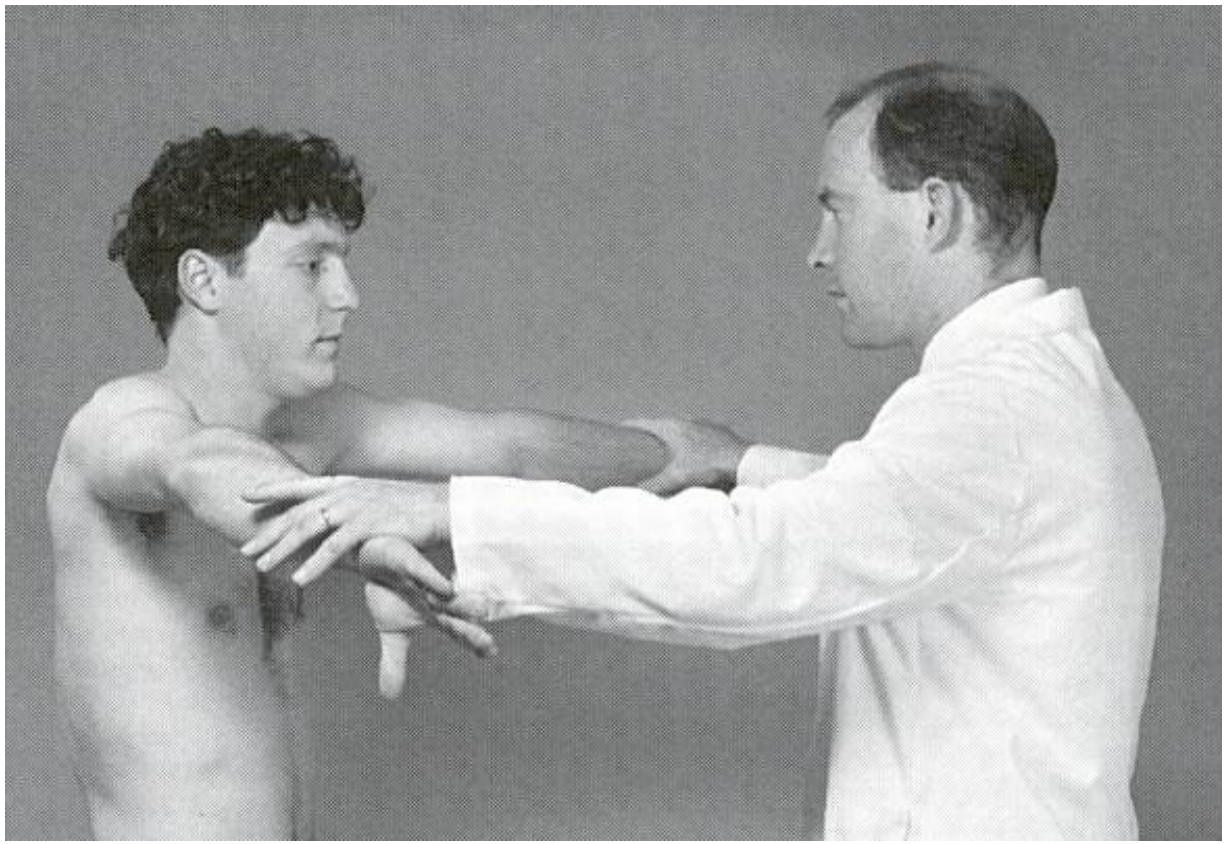
- **Bursectomy**
- **Acromioplasty (Decompression)**
- **Arthroscopically or Open**

Supraspinatus Tendonitis

Signs and symptoms are identical to subacromial bursitis except the inflammation is within the tendon vs bursa

+ Supraspinatus test but no weakness

Supraspinatus Test



Supraspinatus Tendonitis

Treatment: Conservative

- **Rest & Ice**
- **Avoidance of overhead activities**
- **PT (ROM ex's & Rotator cuff strengthening ex's)**
- **Ultrasound (Phonophoresis or Iontophoresis)**
- **NSAIDs, ASA or Tylenol®**
- **Corticosteroid injections**

Supraspinatus Tendonitis

Treatment: Surgical

- **Arthroscopic (Debridement & Acromioplasty)**
- **Open (Acromioplasty, Debridement & RC repair)**

Acromioclavicular (A-C) Arthritis/Arthropathy

Signs and Symptoms

- A-C joint tenderness
- DJD change on Xrays

Physical Exam

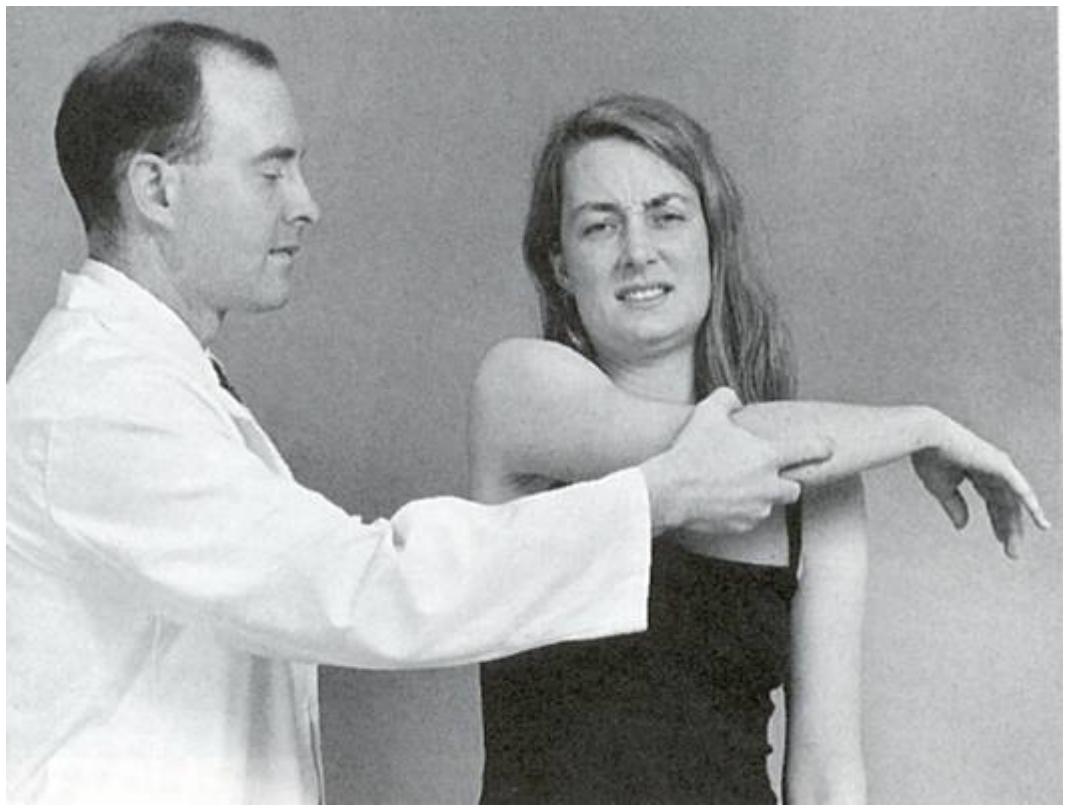
- + Cross-body Adduction

Diagnosis

- Lidocaine injection into the A-C Joint

Acromioclavicular (A-c) Arthritis/Arthropathy

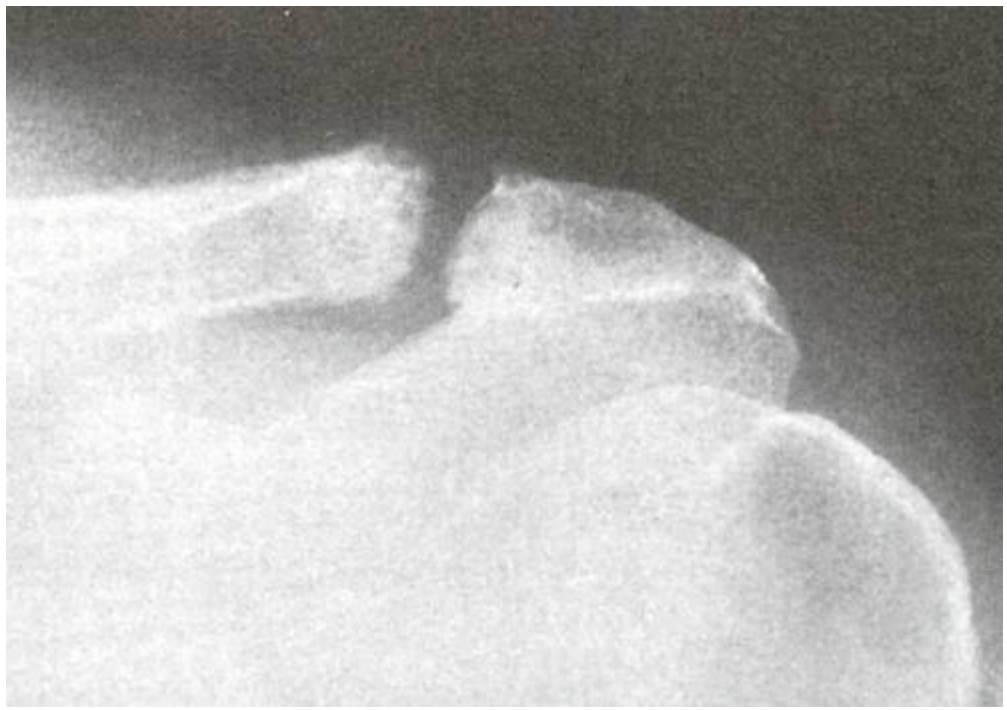
+ Cross-Body Adduction Test



Acromioclavicular (A-C) Arthritis/Arthropathy

Xrays: DJD changes & possible osteolysis or bone cysts

Diagnosis: Lidocaine injection into the A-C Joint



Acromioclavicular (A-C) Arthritis/Arthropathy

Treatment: Conservative

- **Rest & Ice**
- **Avoidance of overhead activities**
- **PT (ROM ex's & Rotator cuff strengthening ex's)**
- **Ultrasound (Phonophoresis or Iontophoresis)**
- **NSAIDs, ASA or Tylenol®**
- **Corticosteroid injections**

Acromioclavicular (A-C) Arthritis/Arthropathy

Treatment: Surgical

- **Open (Acromioplasty & distal clavicle resection using Mumford procedure)**

Bicipital Tendonitis

Signs and Symptoms

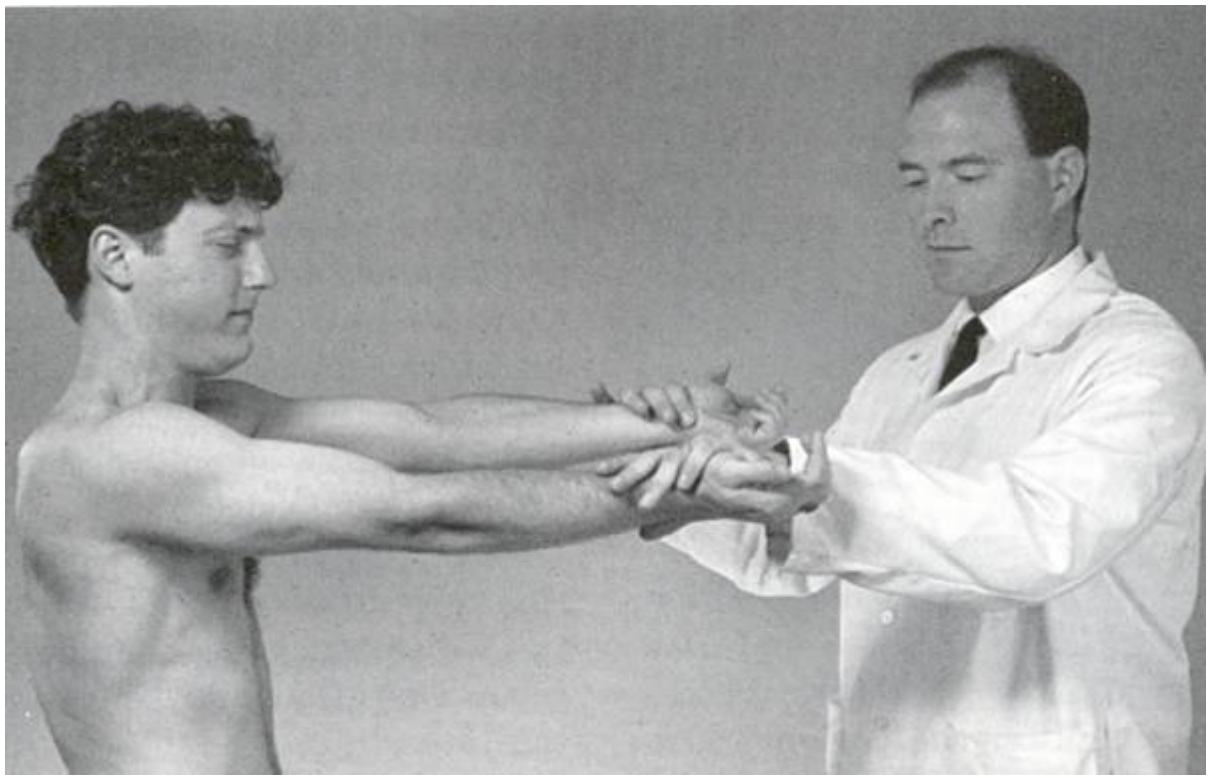
- **Pain to palpation over bicipital groove or tendon**

Physical Exam

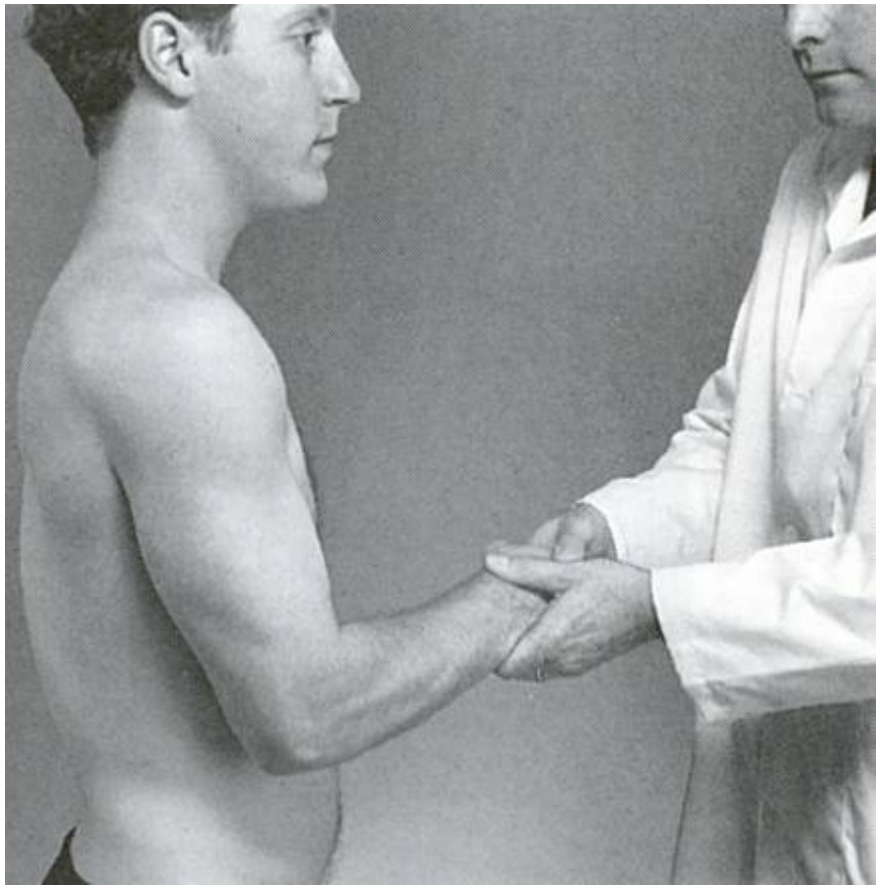
- **+Speed's Test**
- **+Yergason's Test**

Bicipital Tendonitis

+ Speed's Test



Bicipital Tendonitis
+ Yergason's Test



Bicipital Tendonitis

Treatment: Conservative

- **Rest & Ice**
- **Avoidance of overhead activities**
- **PT (ROM ex's & Rotator cuff strengthening ex's)**
- **Ultrasound (Phonophoresis or Iontophoresis)**
- **NSAIDs, ASA or Tylenol®**
- **Corticosteroid injections (BEWARE!)**

Bicipital Tendonitis

Treatment: Surgical

- **Arthroscopic**
- **Open**

Calcific Tendonitis

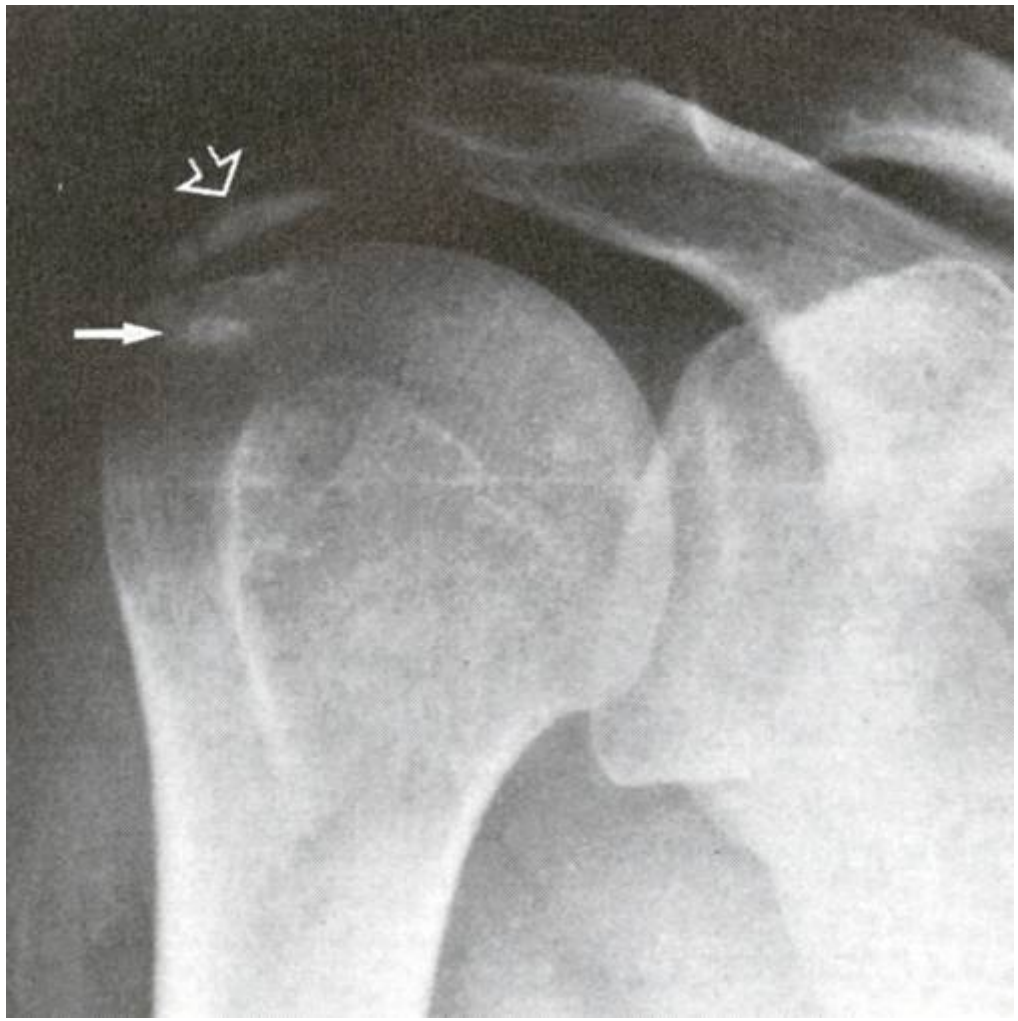
Signs and Symptoms

- **Localized tenderness**
- **Associated with impingement from increased size of the tendon**

Calcific Tendonitis

Diagnosis

Xrays



Calcific Tendonitis

Treatment: Nonoperative

- **Physical therapy**
- **Needling calcification with local anesthetic**
- **Radiotherapy**

Treatment: Operative

- **Surgical excision**

Adhesive Capsulitis

“Frozen Shoulder”

Idiopathic loss of both active and passive motion

Most commonly affects patients between 40 & 60

Most common risk factor is DM Type I

Adhesive Capsulitis

Patients typically have 2 phases

- **“freezing” phase with pain & progressive loss of motion**
- **“thawing” phase of decreasing discomfort associated with a slow but steady improvement in range-of-motion**

Adhesive Capsulitis

Physical Exam -- reveals significant reduction in both active & passive range-of-motion, at least 50%, when compared with the opposite normal shoulder

Motion is painful, especially at the extremes

Pain & tenderness are common at the deltoid insertion

Adhesive Capsulitis

Treatment

- **NSAIDs**
- **Non-narcotic analgesics**
- **Moist Heat**
- **Stretching program 3-4 x daily**
- **? Consider a corticosteroid injection**

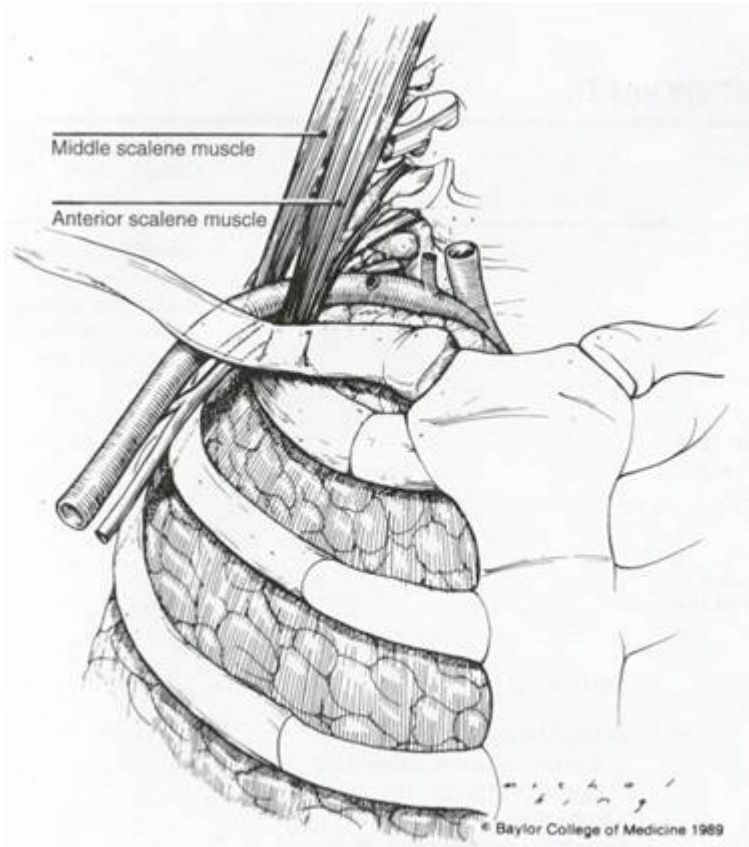
Thoracic Outlet Syndrome

Thoracic outlet syndrome - compression of a portion of the brachial plexus, most commonly the lower portion [C8, T1], and the axillary artery

Thoracic Outlet Syndrome

Etiology

- Compression by the scalene muscles/first rib on the lateral cord of the brachial plexus and the subclavian artery



Thoracic Outlet Syndrome

Signs/Symptoms

Related to overuse- paresthesias to hand and arm, pain in upper extremity and neck, weakness of extremity, drooping of shoulder girdle, clear correlation with posture and position

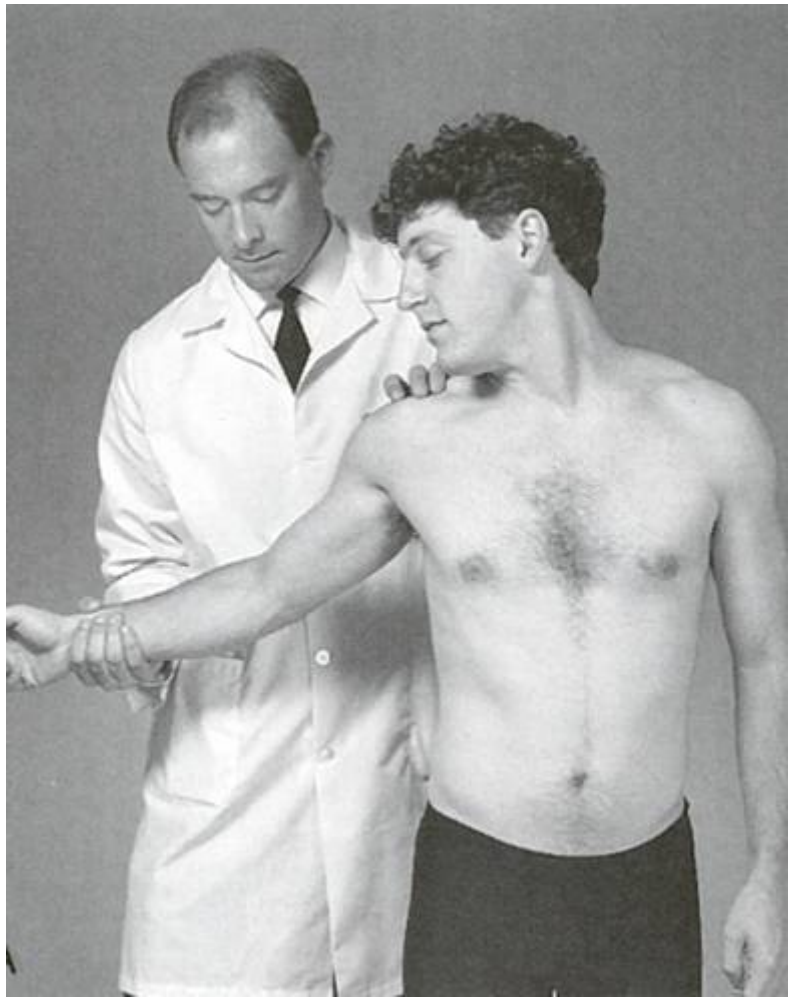
Thoracic Outlet Syndrome

- Diagnosis
  - Adson's Maneuver
  - Wright's Test
  - Roos Test

Thoracic Outlet Syndrome

Adson's maneuver -

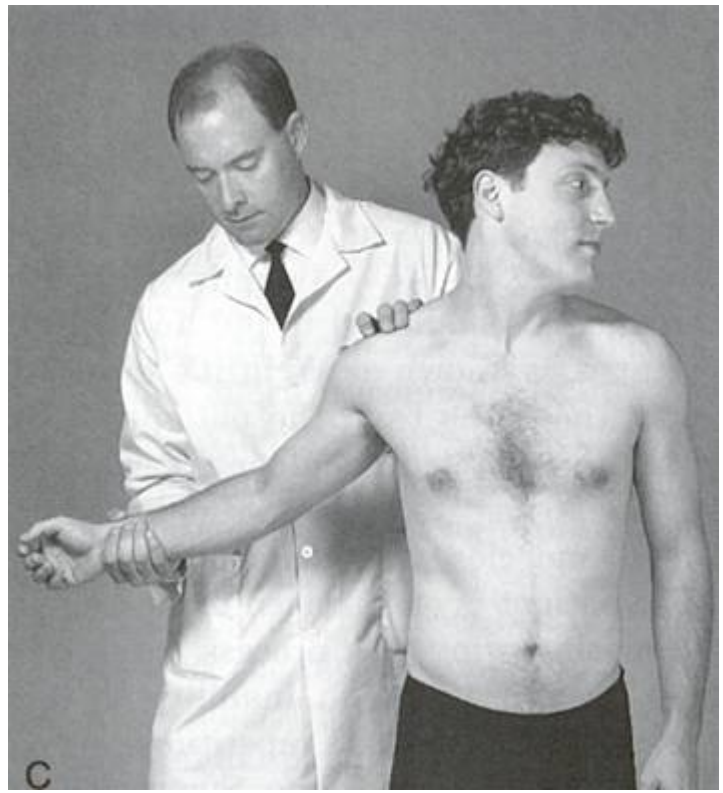
shoulder extension and head rotation to the ipsilateral side while holding a breath leads to loss of the radial pulse



Thoracic Outlet Syndrome

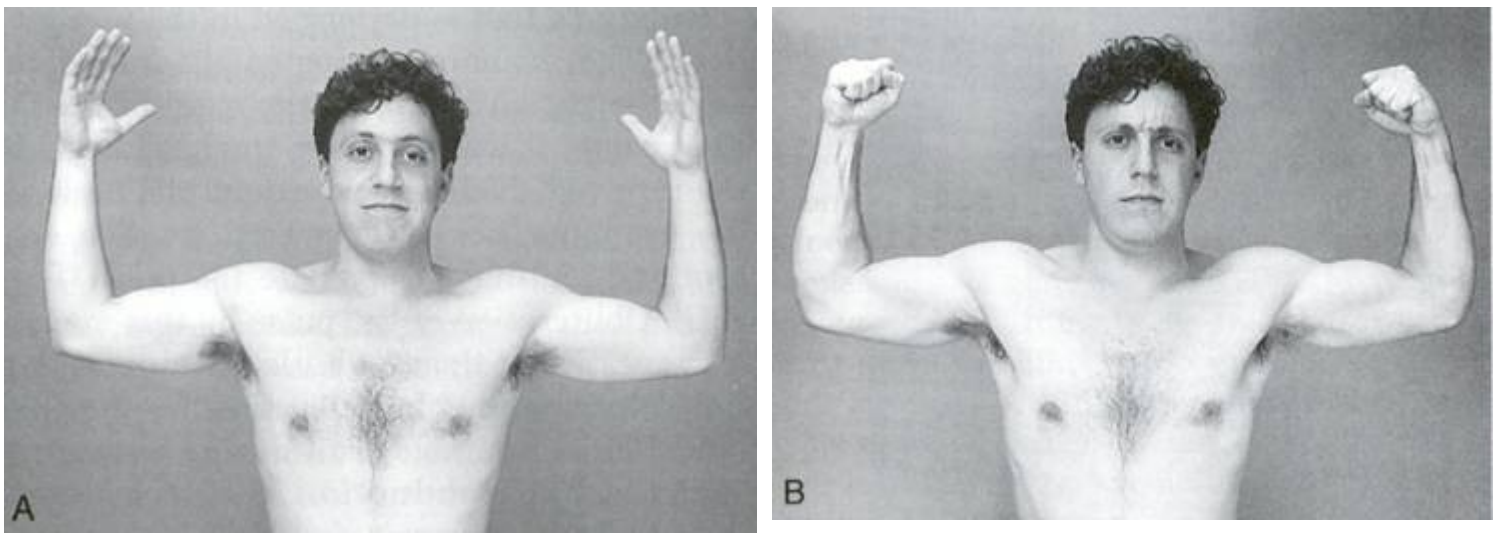
Modified Adson's (Wright's) test

Shoulder extension, abduction to 90 degrees, and external rotation with the head rotated to the contralateral side leads to loss of the radial pulse



Thoracic Outlet Syndrome

Roos test - the arms elevated past 90 degrees and the hands opened and closed rapidly 15 times leads to cramping/tingling of the hands (claudication)



Thoracic Outlet Syndrome

Treatment options

- **Nonoperative - physical therapy, postural training**
- **Operative - first rib resection, others**

Summary

Steps in the general examination of the anterior shoulder

Mechanisms of injury, clinical signs and symptoms, diagnostic tests, and treatment for common shoulder disorders